Dairy Agro-Industry in Brazil andTransnational Corporations: An Analysis of the Opportunities and Challenges

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Abstract: There have been challenges and opportunities for domestic and foreign capital during Brazil's recent developmental process. In relation to dairy products, opportunities have been consistent with the strategies of differentiation and segmentation of products within the market. The major challenge has been the attempt to reduce costs while increasing the quality of inputs. This article analyzes the strategies of the principal transnational corporations of the Brazilian dairy agro-industry, while addressing competition within the industry and the government's industrial policies within the sector.

Keywords: Brazil, dairy, competition, transnational corporations.

1. Introduction

The 1990s were remarkable with respect to the social and economic transformations in Brazil, which were the result of liberalizing policies. They sought to modernize the Brazilian economy and boost its production through the deregulation of structures called snags, which were remnants of the previous developmental attempt, which included state intervention. There has been an increase in the real minimum wage and a decrease in the unemployment rate since the year 2000. Brazil is currently an important emerging country in the international market, as it´s developmental process has created an environment of challenges and opportunities.

In terms of the world economy, the 1990s were characterized by productive and financial globalization, which was marked by a progressive decrease in the degree of territoriality with regard to economic activities. The effects of these policies led entire productive sectors to develop their activities with globalized resources instead of depending on national financial contributions. According to Gonçalves (1998), the causes of financial globalization are a number of technological, systemic and institutional factors. Considering this change in the global economic scenario, it is worth mentioning that Brazilian companies were left in an unfavorable position in terms of economic openness due to the protection policy of the Brazilian government (subsidies and market reserves) prior to the 1988 Constitution, the delay in investments in technology and the lack of training for skilled laborers. The dairy agro-industry sector has not been immune to the changes that have occurred over the last 20 years. It has alternated between moments of crisis, such as the opening of the economy and the deregulation of the sector from 1980 to 1990, and the sector´s reorganization after the domestic market witnessed recovery and growth.

According to Martinelli (2000), in relation to the government´s protection policies, it can be noted that impacts on profitability and productive parameters rose with the deregulation of activities linked to

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production, trade, and the processing of milk at the end of the 1980s. These impacts resulted from the end of price controls, production quotas and institutional programs. To further enforce this point, Carvalho (2005) argues that the deregulation of the sector served as an incentive for the entry of new firms (often transnational corporations), and provided them with higher degrees of freedom, allowing for the creation of new dairy products.

In accordance with Benetti (2000), of the twenty-four Brazilian dairy producers sold in the 1990s, eighteen were acquired by Parmalat which was Italian owned at the time, four were acquired by Argentine groups, one by an American company and one by a Dutch group. Parmalat sought horizontal growth and, concomitantly, vertical integration, given that the dairy manufacturing plant is aligned with its network of raw material suppliers. Also according to Benetti (2000:85), the transnational corporations acquired regional companies and brands, aiming to operate them throughout the national market, or in other words, the purchase of regional companies and/or brands involved, in most cases, the replacement of the original brand for that of the transnational corporation, demonstrating their plan to quickly attain brand recognition within the market. This process resulted in an increase in productivity of important segment suppliers of agricultural inputs and the disappearance of small and medium sized businesses operating in regional markets.

With regard to the new market conditions, it may be emphasized that the changes related to technological factors refer to the introduction of innovations such as the Ultra High Temperature (UHT) process and durable packaging, as well as the need to innovate the administrative aspects of companies in the sector, such as the management of supply chains (Martins and Padula, 2000). In terms of the introduction of the UHT process, Carvalho (2005) notes that there was a transformation of liquid milk into a commodity or, in other words,the possibility of increased product life resulted from the process of sterilizing milk. This led to changes in industrial plants within the milk processing industry. In this manner, the liquid milk market that characteristically operated on a local basisbegan to operate regionally and even nationally in some cases, as the old dichotomy between the market and perishability was overcome. Accordingly, they created the opportunityfor the concentration of production and the processing of milk, and for the resale of the finished product in various regions. As Severo Correa (2009) stated, "from the producer’s side, the tendency toward specialization and the consequent concentration occurred from the imposition of the industry, primarily involving issues such as logistics and the scale of production."

Still concerning the structure, Benetti (2000:87) noted that, in the case of Parmalat, its expansion in the 1990s was linked to the strategy of a network of international branches, which operated in an integrated manner, "in the way that industrial units installed in a country provide the raw material — or with a little elaboration — for industrial units of other countries where they pass through the final processing stage along with the consumer markets." It can therefore be considered a strategy that aims at maintaining flexible business structures, "given the ever-present possibility of the opening and closing of industrial plants in regions (states and countries), due to the redesign of the marketing strategies that target future performance of the group as a whole." In the nineties, Parmalat settled in regional blocks seeking to leverage its advantages in relation to the free movement of final goods and productive resources between plants installed in countries of common markets such as MERCOSUR.

In more recent years, according to data from the Brazilian Institute of Geography and Statistics - IBGE and the Institute of Applied Economic Research - IPEA, milk production in Brazil has shown a significant increase in production value. In this regard, it is among the activities that have presented the most growth from 1998 to 2010, with an increase of 67.22%, only ranking below the growth in soybean production, which was 127.21% and sugar cane, which was 84.85% during the aforementioned period. Note that there are practically no fluctuations in the value of milk production, being different from other activities,which present annual variations in terms of product price and climatic factors.

According to the IBGE, in the period from1998 to 2010, there was a significant increase in the percentage of industrialized milk compared to that of *in natura*milk. In relative terms, industrialized milk has increased more than 9.75% in terms of the total production of milk. Thus, there has been an increase in milk that is inspected by one of the spheres - municipal, state and/or federal - but it is worth noting that approximately 30% of milk production does not undergo any kind of inspection.

When analyzing the process of receiving milk for industrialization, it can be noted that by summing the quantities received by the ten largest companies there is a margin that varies from 34.15% to 49.42% between the years 1998 and 2010, according to the IBGE and TerraViva and LeiteBrasil. Transnational corporations that were listed among the ten largest in the sector had a margin ranging from 9.85% to 23.67% within the same time period. It is noteworthy that the company operating in Brazil that receives the largest amount of milk is DairyPartnersAmericas (DPA),a partnership between Nestlé and Fonterra.

Regarding demand in general, in accord with the IPEA, the real minimum wage in Brazil increased by 85.79% from 1998 to 2010 and the employed population grew 31.15%, which had a strong impact on the demand of dairy products.Therefore, it can be concluded that the dairy agroindustrial system is an integral part of Brazilian agrobusiness and has presented significant changes over the years, principally regarding the participation of national and transnational capital, and it is necessary to continue analyzing the development of the system.

2. Theoretical Foundation

2.l. Structure-Conduct-Performance Model

The Structure-Conduct-Performance (SCP) models relate the basic conditions of demand and supply of a market structure, defined by industrial concentration and by barriers to entry which, in turn, affectconduct, defined by the competitive strategies of firms, and performance,composed of productive and allocativeefficiency, as well as by the quality of products, technical progress and profits. Furthermore, governmental policies form part of this model, formed mainly of regulations, investment incentives, employment incentives and macroeconomic policies. In its most traditional form, the structure determines conduct and performance.

Fontenele (2000:37) points out that despite the explicit causal relationship presented in SCP, feedback effects should be taken into account, as theymutualize the causality of the relationship. Thus, technology can be changedin the same way as search results, altering cost conditions, degrees of product differentiation, among other factors that are expressed in the barriers exploited by firms and components of market structure. Therefore, from the author’s perspective, it is important to perceivethatfeedback effects represent "...the capacity of large companies to modify the environment...", which is a fundamental characteristic of concentrated markets.

Farina (1999:22) contributes by stating, "Industrial Organization literature has systematically demonstrated that there is not a simple and unidirectional causal relationship between market structure, conduct (strategy) of firms and market performance." Thus, the competitive environment, from the author’s perspective, is moldedthrough the interaction of the characteristics of market structures,similar tothe patterns of competition and demand.

2.2. Types of Market Structures

Some authors, linked to theories about the growth of firms, propose that business growth follows structural changes in the industry. Such structural changes encompass not only the number of firms and their relative shares, but also the standard of competition and industry limits, such as the group of products and the technological bases that compose it. In accord withGuimaraes (1982:60), it is possible to expand the limits ofa firm's growth by accelerating the rate of expansion of its current market, increasing its share in the market, modifying its product line and consequently expanding its current market. An industry may transform over time in this manner, as long as its structure is changeable.

According to Guimarães (1982), when analyzing the growth patterns of different industrial structures, it is important to evaluate the entry conditions of new competitors in growing markets. The traditional analysis of barriers to entry has a static character because the standard of competitiveness - conduct - and industry boundaries are data at the time of analysis. In this regard, considering the possibility of the entry of larger-sized companies through the use of capital accumulated in other industries, the analysis of an industry acquires a dynamic element. This implies the possibility to change the technical and economicalstructure in the long run because entrants bring new skills in production and distribution to the industry being analyzed. Moreover, established companies can alter their strategies and try to elevatetheirstake, thereby bringing profit from other sectors.

The degree of concentration and types of barriers created by new firms modify a market's structure, even though the market's classification, in terms of concentration, does not change, as in the case of an already established oligopoly. The idea of the entry of a competitor is extended in relation to the traditional SCP, since the acquisition of an established company by new external capital, even if the amount offered does not change, brings the potential to alter the modes of production and distribution and change the way in which prices are set.In short, it can change the technical conditions and economical structure of the industry.

It is worth mentioning at this point that, as Guimarães (1982:46) stated, the entry of a large producer can "occur if the expected increase of capacity installed in the industry is such that the portion of the market supplied by less efficient firms (which can be eliminated from the industry through the reduction of prices or sales caused by the entry of a large producer) becomes large enough in relation to the scale of the potential entrant." The types of market structures presented by Guimarães (1986) will now be presented.

2.2.1. Competitive Industry

The potential to increase the supply of an industry is given by its accumulated earnings and the credit available to firms. This potential can be equal, higher or lower than the growth of the industry's demand. A competitive industry, according to Guimarães (1982), presents characteristics of equilibrium when its potential for growth corresponds exactly to its growth in demand, regardless of the entry of new firms and the elimination of existing producers, being that the degree of industry concentration tends to increase as more efficient firms grow slightly faster than the average industrial plant.

In this type of market, if the industry's potential for growth is insufficient to keep up with the increase in demand, the disequilibrium tends to be corrected by raising prices and profit rates, thereby stimulating the entry of new producers. Thus, the entry of new producers occurs subtly and smooth adjustments occur between demand and production capacity. If an excessive amount of entry occurs or if major producers enter, there will be an excess of supply that could cause an excessive increase in installed capacity, which will inevitably lead to a decline in prices and a decline in the number of producers in the industry.

Also according to Guimarães (1982:48), when there is excessive expansion of capacity, there exists the possibility of some smaller firms being bought by larger firms, in a way thatthe "prices and profit margins are not affected", and consequently the market remains at the "original disequilibrium between the industry’s potential for growth and the pace at which demand increases, thereby internally accumulating a surpluswhich reappears in subsequent periods."

2.2.2. Homogeneous Oligopoly

According to Guimarães (1982), the homogeneous oligopoly is different from the competitive industry due to the ineffectiveness of price as an adjustment mechanism between supply and demand. When an industry’s increase in demand is surpassed by its potential to grow, there is a rearrangement of market stock between the existing industries and the possibility of the entry of new firms decreases since there are many competitors, and no companies exit the market but simply face a reduction in their market share. In this regard, new firms have incentives to enter the market when demand growth is greater than the potential growth of existing firms.

Another relevant aspect of this structure refers to the speed in which existing producers respond to increases in demand, this being an important strategic element within the industry because, as Guimarães (1982:51) states, "firms that react more promptly to market expansion seize increases in demand, which could eventually prevent laggard firms from making additional investments."

2.2.3. Differentiated Oligopoly

In Guimarães’ view (1982), differentiated oligopoly implies the necessityof firms to continuously search for innovation, which is not only a way to attract competitor’s customers, but is a means of survival in the market. In this way, a firm's research and development has the function of ensuring a flow of product innovations to be used against competitors.

In differentiated oligopolies, increase in demand is not an exogenous variable, conforming to Guimarães (1982), because, through product differentiation, firms can affect the speedof the market’sexpansion. It is important to emphasize, as reported byGuimarães (1982), that the benefitsof innovation are temporary. Firms can maintain high profit rates in the period that follows innovation. When all firms have innovated their products, barriers to entry should be strengthened and elevated profitswill be provided toall members of the industry.

Another aspect to be considered, according to Guimarães (1982), is that the gap between an industry’s installed capacity and its increase in demand can be filled by the entry of new firms. This entry does not necessarily need to present an increase in prices and profit rates, but can be characterized as the existence of a type of unsatisfied demand that makes the barriers to entry ineffective. Thus, the market share of incumbent producers will decline as new firms enter the market, which will not necessarily reduce the industry’s degree of concentration as new producers can be large firms.

2.2.4. Differentiated Competitive Industry

In the differentiated competitive industry, in accord with Guimarães (1982:56), the growth of the industry ultimately differs significantly from that of the differentiated oligopoly, in regard to the moment when the potential growth of the industry is higher than the growth rate of demand. In this regard, "there exists the possibility that intramarginal firms reach their growth potential,thereby advancing in to their competitor’s portions of the market and expelling marginal producers", being that the growth arises from price cuts, increased sales efforts and the intensification of competition through product differentiation.Also according to the author, despite being legitimate to assume that larger firms have a highercapacity to develop and introduce new products into the market, and it is possible for marginal firms to neutralize these strategies through product differentiation in this type of market structure. Note that, in the author's view, it is improbable that all marginal firms are able to differentiate products.

Regarding the loweringof prices and increased sales efforts, the hypothesis that marginal producers is not able to respond to the strategies of large firms, is adopted. It is worth stressing that the effects of price cuts made by one company in the industry tend to affect a particular group of producers more significantly rather than having a similar effect on all members of the industry, such as in the case of a market of homogeneous products.Therefore, according to Guimarães (1982:57), as mentioned in the previous section, thereis a tendencyin the competitive industry of expulsing marginal producers due to the competition imposed by large firms and their efforts to achieve their potential growth. The author points out that this competition, a strategy of larger firms, may lead to the acquisition of smaller firms or the "decision of diversified firms to direct part of their profits from the industry to other quasi-firms”.

2.2.5. Subgroups of the Industry

Lastly, as proposed by Caves and Porter (1977), the idea of barriers to entry of new capital can also be expanded and applied as "mobility barriers" in the competitive practices of firms within the same industry. Barriers created by the most progressive firms to deter potential competitors outside of the industry also hinder the rise of marginal firms that are already established in the industry.

According to Caves and Porter (1977), the idea of "industrial (sub)groups" is a generalization of the barriers to entry theory, which aims to explain the competitive practices within an industry. According to the authors, there exist strategic subgroups within industries because firms differ in size and structural characteristics (competencies). Firms with similar structures often acknowledge their mutual dependence and form groups. These groups can more easily recognize the oligopolistic interdependence betweenthe firms of their own group, than between their group and other groups.

Still in accord with Caves and Porter (1977), there are "mobility barriers" in industry subgroups that eventually prevent or hinder the passage of a firm from one subgroup to another. In this way, "mobility barriers" are similarin nature to the barriers that prevent entry into the industry in theSCP model, which would change the oligopolistic behavior of the industry, as they present themselves in a specific way to companies that pertain to the same group.

2.3. Competitive Strategies of Firms

The competitive strategies of Porter (2004) will now be utilized as a basis for defining the behaviors adopted by companies in the dairy industry. In his work, Porter (2004) discusses three generic competitive strategies: cost leadership, differentiation and focus.

Cost leadership involves the minimization of costs in relation to that of competitors, taking into account aspects related to quality and necessary technical assistance, amongst other areas. This strategy consists ofbuilding installations in an efficient scale, drastically reducingcosts (achieved through experience), rigidly controlling costs and overhead expenses, not establishing marginal accounts for customers, as well as reducing costs in the following areas: R&D, customer service, sales force, advertising, etc..This creates a defense against competition, as lower costs allow a company to maintain returns even after competitors have had to reinvest their profits.

Differentiation is the creation of something that is considered unique in the industry. Methods used to achievedifferentiation, according to Porter (2004), include designs or brand image, technology, peculiarities, customized services, supply chains, among other dimensions. Firms seek to obtain, through differentiation, above-average returns in an industry, not mentioning the fact that it provides protection against competition due to consumers' loyalty to a specific brand and a consequently lower price sensitivity. The author emphasizes that this strategy does not ignore costs, but that they are not the primary strategic targets.

In the strategic method called focus, firms seek specific groups of customers, a specific segment of the product line, or a specific geographic market. Unlike the strategies of cost leadership and differentiation, this approach seeks to successfully achieve a given target. Thus, they seek to meet the target effectively or efficiently, which is differentfrom competitors in the industry that operate in a broader manner. According to Porter (2004), through this strategic method, companies achieve differentiation as a consequence of the desire to best meet the needs of their target, or due to the reduction in costs obtained through the realization of these targets, or a mixture of the two aspects.

3. Methodology

The method used in the paper identifies the basic aspects of demand and analyzes structural elements of the dairy industry.The analysis of demand will be made through the proxy variable, annual household food acquisition (monetary) per capita in kilograms from the Household Budget Survey (POF of the IBGE), for the years 1987, 1995, 2002 and 2008 and involving families that earn from zero to thirty times the minimum wage.To analyze the market structure, the market concentration measurement is used together with the conduct revealed through the firms' competitive strategies, both being interpreted by means of type of market structure.

The data used in this paper that refer to the physical quantity of milk production or reception for industrialization include the years 1998 to 2010 and were taken from the databases of TerraViva and LeiteBrasil. Below (equation 1) is the Concentration Ratio (CR). If a small number of firms account for a large proportion of the production, then the level of concentration is high and there exists the possibility of oligopolistic practices.

$$CR(k) = \sum_{i=1}^{k} Pi \qquad (1)$$

Where: k represents the number of firms and Pi represents the market share of firm i.The Concentration Ratio of Transnational Corporations (CRT) is presented in equation 2.

$$CRT(n) = \sum_{i=1}^{n} PTi \qquad (2)$$

Where: n represents the number of firms and PTi represents the market share of transnationalcorporationi. Note that this index measures the share of the largest transnational corporations or, in other words, the participation of the transnational corporations that are among the ten largest companies in the market.

The Herfindahl-Hirschman (H), which is shown in Equation 3, considers the relative size of firms by squaring the share of each firm in the market. When there is only one company in the industry, the index assumes the maximum value of unity. On the other hand, when firms have equal shares, the index assumes its lowest value of 1/n. The smaller firms contribute less than proportionally to the value of the index.

$$H = \sum_{i=1}^{n} Pi^2 \qquad (3)$$

Where: n represents the number of firms and Pi^2 is the squared market share of firm i.

The normalized Herfindahl-Hirschman (HH '), shown in equation 4, is used to perform a comparative intertemporalanalysis of samples of different sizes, by dividing the numerator - the distance of H calculated from a sample (i.e. companies of year x) and the maximum deconcentration in the sample - and the denominator - the distance frommaximum concentration (1) to maximum deconcentration in the sample (0).

$$HH' = \frac{H-{}^{1}/_{n}}{1-{}^{1}/_{n}} \qquad (4)$$

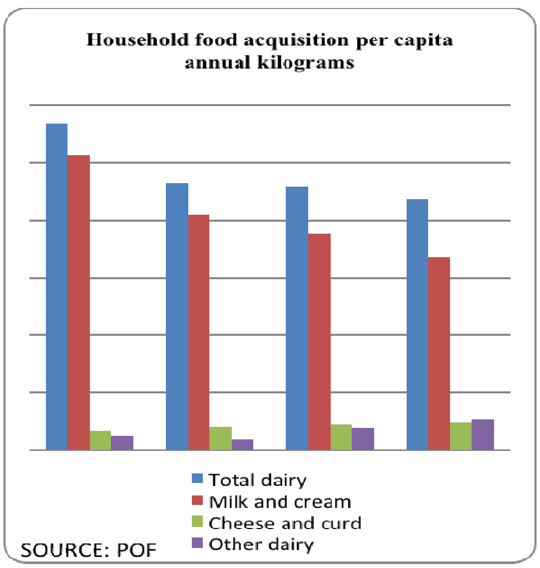
Where: n represents the number of firms and H is the Herfindahl-Hirschman Index.

4. Analysis and Discussion

4.1. Demand

Per capita demand can be seen in the chart, annual household food acquisition per capita in kilograms of the entire dairy group. Consumption of dairy products (in kilograms)steadily decreased from 1987 to 2008, and had a rate of change of -23.38%. Note that this decrease was more pronounced between the years 1987 and 1995, remaining slightly negative between the years 1995 and 2008.The milk and cream subgroupalso had a decrease in consumption between the years 1987 and 2008, and had a rate of change of-34.57%. It is noteworthy that the decline was relatively constant throughout the analyzed period.

The cheese and cream cheese subgroup showed an increase in consumption between the years 1987 and 2008, and had a rate of change of 44.15%. The rate of growth in consumption remained relatively constant throughout the period.Lastly, the other dairy products subgroup had a large increase in consumption between the years 1987 and 2008, and hada rate of change of 128.81%. Between the years 1987 and 1995, there was a small decrease in product consumption in this category, whereas consumption doubled in each subsequent year.



In summary,from 1987 to 2008, there was an increase in consumption of the following products: powdered whole milk, condensed milk, cream and preserved milk, flavored milks (normal, diet, light), soy milk in liquid and powdered forms (normal, diet, light), milk beverages, buffalo milk, goat milk, powdered nonfat milk, mozzarella cheese, white cheese, cream cheese, yogurt and fermented milk.

In more recent years, from 2002 to 2008 in specificity, products with increased consumption at all income levels were: condensed milk (14.86%); cream and preserved milk (13.94%); flavored milk (normal, diet, light), soy milk in powdered and liquid forms (normal, diet, light), milk beverages, buffalo milk, goat's milk (92.19%); mozzarella cheese (47.80%); white cheese (26.60%); and fermented milk (95.28%). Powdered nonfat milk had an increase in consumption at income levels from zero to fifteen times the minimum wage (62.82%).

After thoroughly analyzing demand, it is possible to state that companies have had the possibility of segmenting the market in recent years by differentiating productsaccording to consumers' income levels.

4.2. Industrial Structure

The results of the reception of milkwillbe used as the base of the concentration ratio indices for the four largest firms (CR4), eight largest firms (CR8), the largest transnational corporations (CRT), the Herfindahl-Hirschman (H) and the normalized Herfindahl- Hirschman (HH '). Table 1 presents the results. For the H and HH' indices, the reception of the largest companies of the sector range as follows: 10 companies in 1998; 11 companies in 1999, 2000 and 2001;; 13 companies in 2002, 2003, 2004, 2005, 2009 and 2010; 16 companies in 2006 and 2007; and 14 companies in 2008. For the CRT indices, the reception of the largest transnational corporations of the sector range as follows: 4 companies in 1998, 1999, 2000, 2001, 2002, 2003 and 2004; 3 companies in 2005, 2007, 2008, 2009 and 2010; and 1 company in 2006.

Table 1:Concentration Indices–quantity of industrialized milk

Indices	CR4	CR8	CRT	H	HH´
1998	33,60%	45,62%	23,67%	0,1526	0,0584
1999	34,50%	46,99%	23,53%	0,1474	0,0621
2000	32,02%	43,95%	22,53%	0,1470	0,0617
2001	30,51%	41,91%	21,72%	0,1385	0,0523
2002	27,86%	35,16%	20,26%	0,1418	0,0703
2003	26,15%	33,91%	19,29%	0,1390	0,0672
2004	23,89%	31,32%	16,05%	0,1370	0,0650
2005	25,46%	33,04%	11,87%	0,1344	0,0623
2006	25,50%	33,01%	10,21%	0,1115	0,0523
2007	27,61%	37,06%	10,06%	0,1089	0,0495
2008	29,96%	40,72%	9,85%	0,1209	0,0533
2009	30,97%	39,52%	11,76%	0,1362	0,0643
2010	27,78%	34,90%	11,51%	0,1497	0,0788

*Note: BRF – Brasil Foods did not release data this year.
Source: Elaborated by author

According toGasqueet. al. (1998), the structure that lasted from 1980 to 1985 is considered a differentiated competitive industry in the dairy products field, a competitive industry in the refrigerated milk field and a homogeneous oligopoly in the liquid milk field. In accord with the analysis of the bibliographic references and of the theoretical review,Brazil entered the 1990s during a periodin which its economy was openingand in which subsidies and market reserves were suppressed. Conforming to Aguiar (2009), the national dairy industry during this time wascharacterized by a change that occurred inits structure, as it changed from a competitive industry without barriers to entry or exit to a more concentrated structure with barriers.

Table 1 demonstrates that the largest companies in the dairy industry maintained relatively constant shares in the sector between the years 1998 and 2001, but the top firms did experience a small drop in market share due to the other firms of the sector. Mergers and acquisition of marginal companies and regional brands characterized the conduct of the sector. It is worth noting that, in 1998,Ivoti took control of Milkaut andBatavotook control ofParmalat; in 1999, Queijo Minas took control of Perez Companc, Mococatook control of Royal Numico, and 20 other mergers and acquisitions occurred between the years 1990 and 1997 (Bennetti, 2000). Thus, in generalized terms, there was a small reduction in the market share of the largest companies in the CR4 and CR8 indices, and in the CRT index,which measures the market share of transnational corporations, due to the reception of industrialized milk from the sector. The consistency of the major companies' market shares in the industry is partially due to the innovation that the companies maintained in the sector and, more specifically, to the control they had over the UHT process.

The CR4 and CR8 indices demonstrate a decrease in the market shares of the largest companies in the dairy sectorfrom 2002 to 2006. In 2003, new firms (CONFEPAR and LíderAlimentos) entered the list of the thirteen largest companies in the industry. These companies were able to join the leaders of the industry because UHT and durable packaging were no longer an innovation exclusively available to a select group of companies. The HH' index demonstrates that, between the years 2002 and 2007, the largest companies in the dairy sector became decentralized and new firms entered.The CRT index presents a strong decrease from 2002 to 2008. In 2005,the company ParmalatBrasilwas founded and separated from the Italian parent company and, in 2006,Perdigão S.A. acquired controlling interest of the company Batavo.

In 2006,the following new firms entered among the sixteen largest in the industry: BomGosto, Frimesaand NilzaAlimentos. According to the Department of Labor and Employment (2006), the entry of new firms can be explained by unsatisfied demand due to an increasein the real average minimum wage and the increasein the number of families enrolled in social programs, rendering ineffective the barriers to entry.It is noteworthy that from 2008 to 2010 the CR4, CR8 and HH' indices were concentrated, with the exception of the CR4 and CR8 indices in 2010 since the data of the company BRF were not available for 2010. This may infer that the market among the largest companies in the industry was also concentrated. The CRT indexincreased modestlyduring the same period.

According to Rock (2009), the National Bank of Social Development(BNDES) has financially contributed to large companies in the dairy sector since 2007. For example, BomGosto receives a financial contribution of 45 million Reais from BNDES. This is enabling the company to acquire control of LaticíniosDaMatta and Laticínios Santa Rita this year, both of which are in the state of Minas Gerais. In 2008, the company acquired control of Nutrilatand Corlac, both of which are in the stateof Rio Grande do Sul. In 2009, BomGosto merged with LíderAlimentos, thereby creating LBR –LácteosBrasil, an operation that received financial investment fromBNDESPar. According toSpada (2011),in 2011, the Administrative Council for Economic Defense (CADE)authorized the merger between Perdigão and Sadia, forming BRF - Brasil Foods, the third largest seller of milk in Brazil. Still according to the administrative report of the BNDES (2009), BNDES Participações S.A.bought equityin BRF Brazil Foods in the amount of 430 million reais in 2009. These facts and indices prove that there is a consistent trend toward industry concentration.

Unlike the strategy adopted in the 1990s of replacing the original brand with that ofParmalat, companies that merged in the 2000s maintained their originalbrands.For example, LBR maintainedthe following brands:Boa Nata, BomGosto, DaMatta, Ibituruna,LeiteBomLíderesAlimentos, Parmalat and Poços de Caldas; BRF maintained the following brands:Batavo, Cotochés and Elegê. This new strategy in mergers is linked to the value that the brands present as assets, considering that the brands of the acquired companies were alreadyestablished in the local and regional markets and even at the national level.The data and the predominantbehavior of the dairy industry prove that, after the year 1998, the structure of the Brazilian dairy industry became relatively concentrated and can be characterized as an oligopoly.

4.3. Behavior of Transnational Corporations

The participation of transnational corporations in the Brazilian milk agro-industry is longstanding. The principal transnational corporations that worked in the dairy industry and were among the ten largest in the sector between the years 1998and 2010 were: DPA (a joint venture between Nestlé and Fonterra), Parmalat and Danone.

Nestlé entered the Brazilian market in 1921. In 2003, Nestlé created DairyPartnersAmericas (DPA) in a joint venture with Fonterra, thereby forming the largest company in terms of reception of milk in Brazil. According to Porter (2004), the company's main strategy is differentiation. The company segmented the dairy market with various brands and product lines. The company currently possesses thirteen brands in the dairy industry, and operates in the following product segments, having one or more brandsin each: milk beverages, petitsuisse, UHT milk, fermented milk, powdered milk, probiotic milk, condensed milk, liquid yogurt, natural yogurt, yogurt beverages, layered yogurt, enriched yogurt, dairy compounds, dairy desserts, and cream; some of which may be integral, skim, light, fruit flavored, and with added calcium.

Danone began operating in Brazil in 1970, with the launch of the first yogurt that included fruit pulp. The main strategy adopted by the company in the dairy sector was focus, as it had a strong presence in the specific product line of yogurts. Note that the company secondarily used the strategy of differentiationin its product lines for children and adolescents. The company works with nine brands, each of which specializes in adifferent type of product: enriched yogurt, light yogurt, yogurt with fruit pulp, fermented milk, dairy desserts, petitsuisse and dairy beverages.

Parmalat entered the Brazilian market in 1974 through a joint venture with domestically fundedLaticíniosMococa. In the 1990s, it increased its share in the milk agro-industry, thereby reaching second place in terms of the reception of milk. In 1998, Parmalat formed an agreement with Batavo and created Indústria de AlimentosBatávia S.A., which became the holder of the Batavo brand. As a result of this agreement, investments were provided and new products were launched, including milk, yogurt, cheese, butter and desserts, all marketed under the brands Batavo and Parmalat. In 2005,ParmalatBrasilwas created,which was separate from its Italian parent company; both companies financially collapsedthat year. In 2006, ParmalatBrasil broke the agreement with Batavo. In 2010, ParmalatBrasil was incorporated into LácteosBrasil's brand portfolio.

Parmalat's main strategy between 1990 and 2005 was cost leadership, as the company succeeded in reducing their costs in the nineties (mainly in milk collection in the domestic market or through imports) and thus reduced the price of long life milk, making it competitive with type C milk. According to Wilkinson (2008), thecore productof the company has always been long-life and pasteurized type B liquid milk,and it has maintained innovations in packaging and preservation techniques. Also according to the author (2008), the brand was less significant in the areas of yogurt and dessert. As a secondary endeavor, the company differentiated products for the regular and special milk segments. The company utilized basically one brand to market their line of products that consisted of: regular milk, special milk, yogurt with fruit pulp, liquid yogurt, cream, condensed milk and milk beverages.

This differences between the strategies of the transnational corporations with the highest market shares during the period suggest a division of the oligopoly into two subgroups: differentiated oligopoly, which explores product differentiation and uses the focus strategy, and mixed oligopoly, which presents aspects of brand differentiation combined with elements of homogeneous oligopoly such as the exploitation of scale to reduce the average cost, and cost advantages due to access to cheap credit for investments. This division of the industry into subgroups is in accord with what Caves and Porter (1977) define as a generalization of the theory of barriers to entry.

5. Conclusion

In conclusion, there was a change in demand between the years 2002 and 2008, which increased the possibility for companies to segment the market and differentiate products in accord with the income class of consumers. The demand *per capita*of milk and cream decreased, which led to increases in demand for cheese, cream cheese and other dairy products (especially yogurt).

During the period of 2002 to 2007, the indices presented deconcentration for the first time, which was followed by higher concentration,beginning in 2007. During the period of 2002 to 2006, in terms of the reception of milk, there was industry deconcentration among the eight largest companies of the sector. From 2008 to 2010, all of the indices of this variable presented a trend towards concentration. The CRT index shows decreased concentration between the years 1998 and 2008 followed by a modest increasein concentration in the years 2009 and 2010.The dynamics of Brazil's dairy industry have changed over time. It appeared to be a competitive industry ever since the beginning of trade in the nineties and then, from 1998 to 2010, it presented characteristics of both a differentiated oligopoly and a mixed oligopoly.

The recent concentration (since 2007) in the reception of milk is due to the BNDES's investment strategy.It is noteworthy that transnational corporations were not included in the BNDES's investment strategy, which, in turn, eventually decreased their market shares.In terms of mergers and acquisitions, different strategies can be observed in the Brazilian dairy market, as, in the nineties, the original brand of acquired companies was replaced by that of the acquirer,but those that occurred in the past decade are characterized by the maintenance of the original product brand.

Lastly, it is worth noting that the only transnational corporations that succeeded in the domestic market were those whose administrationresponded to changes in demand or, in other words, the companies thatexplored the populations' increased purchasing power and, because of this, segmented the market by differentiating their products and brands.

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