Investigation of Predatory Practices in the Brazilian Beer Markets

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Abstract: This paper aims at making inference regarding the competitive conduct of beer manufacturers in Brazil and at investigating alleged predatory behavior in the market from data disaggregated at the brand level. By making use of the theoretical framework on predation and of the New Empirical Industrial Organization methodology, we propose a structural model of conduct, based on a game of Bertrand competition with product differentiation, in order to better represent rivalry among players in this important market. Final results revealed that it is not possible to reject the hypothesis that the dominant firm presented over-competitive conduct for some of its brands, and therefore predatory pricing cannot be disregarded.

Keywords: Industrial Organization, Competition, Predation, Market Power, Conduct.

1. Introduction

The present work aims to promote an analysis of the competitive behavior by the beer manufacturers in the country and investigate possible predatory practices in the market. Starting from the theoretic referential about predatory pricing, the present investigation will perform an analysis of the so called “Conduct parameter” by the firms, by means of the theoretical modeling and estimated econometric originated from the New Organization Empiric Industrial (NOIE), as in Genesove and Mullin (1997).

To exclude and or prevent a competitor’s expansion in the market, a dominant firm can adopt sustainable strategies that aim at reducing the competitive dynamic of the market. The practices of typically predatory nature, such as management of portfolio with the use of fighting brands and adoption of bonus and loyalty programs will be analyzed empirically in the present work. In the market analyzed here we notice complementary conduct in the two channels of beer sale-bars and self-service. In the first channel, we observed the strengthening of the direct distribution, emphasis in the placement of firm refrigerators in the sales spots and adoption of programs with built in exclusivity. In the second channel, we noticed the choice of a brand with characteristics of fighting brand and creation of a low cost brand, only in the region where there has been verified increased competition, with growth of other manufacturers.

Using the analysis of the evolution of the estimated conduct parameter for each brand in the market, starting from their own elasticity-price and data obtained from a previous study of demand, it is possible weave interferences over the average degree of the competitiveness between firms, as well as notice the evidence of possible anti-competitive practices in the market. For this purpose it was decided to focus on the fragmentation per distribution channel in the beer market - the channels “self-service” and “bars”- and per beer brand - the four major brands inside of the “Pilsen” segment, making up to more than 80% of the market.
This study is divided as following: In section 2, there will be a theoretical revision of the predatory concept; in section 3 it will be developed a theoretical model of the competitive conduct; section 4 will present an econometric modeling associated with the theory model; section 5 will have the results of the estimations analyzed and the parameters of conduct will be presented and commented.

2. A Theoretical Approach to the Practice of Predatory Pricing

One of the classic exclusion conducts dealt with by the antitrust theory, consists in the practice of predatory pricing, represented by a type of behavior where the prices are low to the point of influencing the competitive process. Considering that low prices are also a positive consequence of the competitive process, the antitrust authorities face the difficult task of defining what is to be considered predatory from healthy competition. The elimination of inefficient firms is the result of the competitive process, but this process can be hurtful, if efficient rival firms are also expelled from the market through the excessive lowering of prices by the dominating firms.

Traditionally, the predatory problem has been identified through the observation whether the dominating firm has incurred losses, or in the short run in a particular market forcing the exit (or not allowing the entering) of a rival firm, expecting that its profits above normal could be obtained in the present or future markets. The more specific test to gauge the reduction in competitive and non-competitive pricing was introduced by Areeda and Turner (1975). According to the authors, prices below cost should be considered definitely illegal. Considering that is rare to find documentation to show statistics of production cost basis, the authors suggest the use of the average cost as evidence for the test.

It has been 20 years, since Areeda and Turner proposed how to address the predatory pricing issue, the test raised controversy for years and the debate was particularly enriched with the use of concepts of the Theory of Games and Strategic behavior in oligopoly markets. These works are described in Janusz Ordover and Garth Saloner (1990). The central question in these models is the asymmetry of information between the agents in the market. The dominating firm is better informed than its competitors in models where the predator induces market exit of the smaller rivals.

The new literature in industrial organization about predatory behavior, presents three alternative types of models:

i) There are analyses on the Theory of Games based on the idea of “deep pocket”. In this line, the most recent contributions show how predatory behavior could occur in a balanced way if information is imperfect and the financial resources of the dominating firm are substantially stronger than any present and or future potential competitor;

ii) There are a second set of articles showing how in the presence of imperfect information, an incumbent firm could establish a reputation of toughness and discourage potential new competitors entering the market to go head on with the stronger incumbent firm;
Finally, a third set of works shows that, when the information is not symmetric about costs and demand, a predator can use a lower price to let a competitor know that might be better under the present conditions of demand and cost to exit the market than to face the stronger dominating firm.

The development of the Theory of Games, deepened the understanding of predatory behavior. It demonstrated that in the presence of asymmetric information (about market conditions, costs, a particular "taste" for predation or simple strategy of other firms), or imperfect flow of information in the financial markets, predation is theoretically possible, even in the absence of entry barriers that traditionally were thought to be a necessary condition for such behavior.

Once identified the predatory behavior and anticompetitive conducts adopted by the dominating firm, it has to be established its abusive nature. In order to accomplish this, one should compare the advantages and negatives derived from them, as presented by Glais and Laurent (1983):

"About the market dominated by the firm in question, the competition is already fragile, even though all the extra barriers cannot be accepted by the regulating bodies responsible for the good performance of the market. The negative consequences to the market of the poisonous as well as reprehensible behavior of this firm could be considerable for two reasons. The restrictive practices, as they reduce even more an already restricted competition, are more damaging because the competitors and partners of the dominating firm cannot fight back" (op. cit., p. 353).

Evaluating these particularly serious issues, the advantages provided exclusively through extra restriction on the side of the dominating firm should be heavy handed in order to balance the risks to the market. Taking this into consideration, we can assert that even in the absence of preventive existing laws per se (in the European Union as well as under French Jurisdiction and others) all anti-competition measures entered by a dominating firm could be condemned.

The question of the monopoly reached through the strategy of predatory pricing is present in the history of antitrust since its beginning. Sherer and Ross (1990) thought that the emergency of the rule of reason coincided with the trial through the US Supreme Court in the cases involving Standard Oil and American Tobacco, both in 1911. In the first case that implied the use of the rule of reason, Standard Oil was accused of maintaining a control over 90% of the industry of oil derivatives (at the time kerosene and burning oil), status that was obtained through the acquisition of more than 120 rivals, the discriminatory use of pricing in rail transportation, preventing access to oil supply sources through the acquisition of Oil Pipes, industrial espionage and finally through the use of pricing wars to exclude rivals of the market or bring them to sell their businesses. The authors noticed it is a controversial fact if Standard Oil truly reduced prices in a profound way to destroy rivals or to teach them a lesson. It is their understanding that the firm used a sophisticated limit-pricing strategy region-by-region (p. 450).
In the case of American Tobacco, the Supreme Court accused the Firm of monopolizing the cigarette market and other tobacco products acting unreasonably like excluding rivals from accessing distributors, buying out 250 competitors and adopting predatory pricing.

Sherer and Ross (op. cit.) present a strategy of pricing exclusion as an alternative to long term pricing by the market dominant firm:

“When there is a competitive fringe of appreciable size and when the dominant firm has a significant unit cost or image advantage over fringe members, the dominant firm long-run profit-maximizing strategy will often be to set its price initially below the level of fringe firm unit cost and drive the rivals out. This is more likely, the larger the dominant firm price-cost advantage is the lower its time discount rate is, and the more rapidly fringe Firm’s exit in response to price below their unit cost (…). In many instances, given its cost advantage, the dominant firm will continue to earn positive profits as it squeezes rivals out. However, with sufficiently large initial fringe out put and values of [unit cost], the dominant firm may rationally cut the price temporarily below its own unit cost in order to hasten rival’s exit and enhance its market share. IN either event, as the fringe dwindles, the dominant firm gradually raises its price, realizing rising profit margins, while the exit of remaining rivals is slowed down.” (p. 364,).

The authors illustrate their model of strategic pricing in oligopolies with cases of North-American history that confirms the theory’s consistency. In the case of exclusion prices, they mention cases in the brewing industry, where the principal nationally advertized brewers enjoyed an image advantage over local and regional beers and, after establishing new manufacturing plants during the 1960s, they gained an impressive unit cost advantage. Their strategy, with Anheuser-Bush playing an increasing dominant role, was to squeeze the price differential between popular and premium brands. As a result, the number of beer manufacturers in the USA came down from 404 in 1947 to 108 in 1972 and 16 in 1982. The combined market share of the four leaders went up from 21% in 1947 to 85% in 1987 (p. 371)

As a result of the Industrial Organization’s recent developments, the understanding of predatory pricing has evolved from the ideas of losses incurred by the firm that adopted those practices. A modern reading of the practice of predatory pricing is offered through Edlin and Farrel (2004), to whom:

“Predation occurs when a firm offers consumers favorable deals, usually in the short run, that get rid of the competition and thereby harm consumers in the long run.” (p. 502)

According to the authors and in particularly, as pointed out by Edlin (2001), there is no reason to reduce predatory cases to situations where one can verify pricing below cost, if prices above cost can also hurt the consumer, by limiting the competition.
The definition of predation centered in the conventional thesis of sacrificed profits was offered by Bork, during the trial Neumann v. Reinforced Earth Co. (786 F 2nd 424,427, 1986):

“Predation involves aggression against business rivals through the use of business practices that would not be considered profit maximizing except for the expectations that 1) actual rivals will be driven from the market, or ... 2) rivals will be chastened sufficiently to abandon competitive behavior the predator finds threatening to its realization of monopoly profits.” (apud Edlin e Farrell, p. 510).

At the same time, the sacrifice of profit in the short run is not always present in predatory pricing. A low-cost monopolist can hurt competition (not only the competitors) using strategically its advantages to exclude competitors with little or no effort, as Edlin (2001) explains. Sacrifice has been defined by Bork (1978, p. 145) as an “investment in monopoly profit”. This voluntary sacrifice, having the damage to competition as motivation, could also be associated to other legitimate reasons. Today’s production can generate lower costs in the future in a learning by doing industry or, in a straight forward form, “sacrifice” in a product could be immediately compensated by raising the profits in a complementary product. This way, the profit sacrifice in the short run is neither necessary nor sufficient to create damage and could be distant from both cases.

To monopolization, the sacrifice of profits is not necessary if the dominant firm detains substantial cost advantages (adding the tax and financial advantages). Edlin (op.cit.) shows that sometimes an efficient firm uses its advantages to offer good deals in stable markets, something that is good for consumers and economic efficiency, but occasionally an efficient firm can do just the opposite, charge high prices or offer services and or products of low quality while it faces little or no competition and offer the opposite only when the competition appears.

From a low-cost monopolistic point of view, to offer great deals after the arrival of a new competitor in order to hurt and even provoke the exit of the newcomer does not necessarily imply sacrifice. One should change focus from “sacrifice plus financial recovery” to “exclusion with great damage to the consumer and or efficiency”.

Farrell and Edlin (op. cit.) suggest, at last, a change of focus on predatory behavior, from profit recovery in the future to damage to the consumer and or economic efficiency.

Taking into consideration the concept of predatory pricing described in this section, we look to make an empirical analysis about the competitive behavior of brewing manufactures in Brazil, through the usage of modeling and econometric estimative. This is the subject purpose in the following sections.
3. Modeling Theory of Competitive Behavior

The most common modeling used to analyze competitive behavior of firms in oligopolistic markets (as in the beer market in Brazil) is the so-called New Empirical Industrial Organization (NEIO). Bresnahan (1989) promotes a classic description of this approach, summarizing it in two basic elements:

i) The behavior of the firm as well as the behavior of the industry as a whole in relation to strategic variables as price and quantity is defined and represented by unknown parameters to be estimated; in this way the econometric handling of the market’s basic behavioral equations allows a direct identification of what it is called “conduct parameter”;

ii) By consequence and utilizing the estimations of conduct, inferences over market power turn quantitatively feasible and in the simple form of test of hypothesis. In this way, one has an approach with high demand for statistic data, but that allows the comparisons among different hypothesis, like perfect competition (lack of strategic interaction) and of the joint maximization of profit (coordination and collusion) as well as intermediate hypothesis, typical of oligopolistic models.

We pursued to develop a model with simultaneous equations based on this approach of Industrial Organization. The model is described below.

Consider a brewing market with product differentiation and static price competition, hypothesis also found in Hausman, Leonard and Zona (1994), Slade (2004), Pinkse and Slade (2004).

By notation,

\[ q_i \] and \[ p_i \] are the quantity and the own price of each firm, respectively.

As discussed in Oliveira (2004), assuming, as in Hausman, Leonard and Zona (op.cit.), that the consumption process of beer is represented by the model AIDS (multistage budgeting), so that we can obtain a matrix of estimated price-elasticity in a flexible fashion. Once that structure is assumed, the problem of the firm in the market can be narrowed to the following first-order condition to maximize profits:

\[
\begin{align*}
\text{Max} & \quad RT_i - CT_i(q_i, \Phi) \\
\text{Max} & \quad p_i q_i - CT_i(q_i, \Phi)
\end{align*}
\]

Where \( CT_i \) is a function of the total cost and \( \Phi \) is a vector of cost shifters of firm i.

Developing (1), we have the relation in (2):

\[
\frac{\partial p_i}{\partial q_i} q_i + \frac{dCT_i}{dq_i} = 0
\]

Where \( dCT_i/dq_i \) is the marginal cost of firm i \( (MC_i) \). Through additional algebraic manipulation we arrive to the following form of first-order condition:
\[ p_i = MC_i + \frac{1}{|q'_i|} q_i \]  

(3)

Where \( q'_i = dq_i/dp_i \) and \( |q'_i| \) represents the absolute value of \( q'_i \). The result in (3) is representative of Nash equilibrium in a game of price competition (Bertrand-Nash), becoming this way a reference as far as the rivalry between firms in the market is concerned.

Let us suppose now as in Slade (op. cit.) there are parameters \( \theta \) that measure the extent of the deviation from the null hypothesis of static Nash-equilibrium behavior for a given game. These parameters, called “conduct parameters” would be modeled as following:

\[ p_i = MC_i + \theta_i \frac{1}{|q'_i|} q_i \]  

(4)

The analysis of \( \theta_i \) is in the center of studies of NEIO, as presented by Bresnahan (1989). This happens, because there are important existing values that can be self-assumed, so that it can clarify the competitive behavior of a certain agent in a particular market situation. In particular, when \( \theta_i = 1 \) returns to the result of (3), the so-called non-cooperative equilibrium. For values below this level, there is the description of increased competition (so that profits are maximized), something that could occur in certain situations of imperfect or incomplete information, unexpected surprises in cost and or demand or even of deliberate over competitive conduct, as in the use of predatory pricing and fighting brands.

Genesove and Mullin (1997) give up this kind of analysis to deliberate about predatory behavior in the sugar industry in the USA at the end of the 19th century. When \( \theta_i = 0 \), than \( p_i = MC_i \), representing the strategy of de marginal-cost pricing. In practice, this strategy reproduces the result of Bertrand’s game in markets with the homogenous products, something that in situations of heterogeneous brands, again is only expected in certain cases of extreme competition (where firms discard their monopoly power in price wars), or in cases of predation. We have the modeling presented in (4) allowing the analysis of competitive conditions in the country, as well as being able to evaluate the anticompetitive practices in the market.

4. Econometric Modeling

The proposal of econometric modeling here implemented was to estimate an equation of first-order condition as presented in (4) of the previous section, for each market brand.

A data base for estimation of the linearized AIDS model contains information collected by Nielsen, bimonthly during the period between the first two months of 2001 and the last two months of 2003.; the data is distributed from the following regions of the

The data is broken up by brand and for analysis purposes, it was desired to mirror the competition in segment of clear beer (“Pilsen”, as considered “Medium Price” or, as it is called in the industry, mainstream segment). This segment is dominant in terms of market revenue aside of being the most traditional in the country. Inside this segment, the following brands were analyzed: 1. Nova Schin Pilsen (sc); 2. Skol Pilsen (sk); 3. Brahma Chopp (br); 4. Antartica Pilsen (an). Together they represent approximately 80% of total volume sold in the segment, be that through distribution “self service” or in Bars\(^1\). It was taken into consideration for estimation purposes, the following empirical relation equivalent to the first-order condition in (4):

\[ p_{ikt} = MC(\Phi_{ikt}) + \beta_{ikt} q_{ikt} \]  

(5)

Where the indexes i, k, r and t represent, respectively, the brand, the channel of distribution, the region, and bimonthly from a chosen sample point. MC represents marginal cost, \( \Phi_{ikt} \) is a vector of cost shifters, \( q_{ikt} \) is the demanded quantity and \( \beta_{ikt} \) is an unknown parameter, that has the “conduct parameter” built in. In his modeling, the behavior can be identified as following:

\[ \beta_{ikt} = \theta_{ikt} \frac{1}{q_{ikt}} \rightarrow \theta_{ikt} = \beta_{ikt} \left| q_{ikt} \right| \]  

(6)

As in the demand study (Oliveira, 2004) we estimated their own price-elasticity, instead of \( q_i' \), to generate a need to find the relationship between the two sources of information. We have than through the definition of demand elasticity that:

\[ \eta_i = q_i' \frac{\bar{p}_i}{q_i} \rightarrow q_i' = \eta_i \frac{\bar{q}_i}{\bar{p}_i} \]  

(7)

Where \( \bar{q}_i \) and \( \bar{p}_i \) are respectively the middle sample of quantities and prices of firm i in the distribution channel k. Utilizing the relation (7) in (6), we have:

\[ \theta_{ikt} = \beta_{ikt} \left| q_{ikt} \right| \rightarrow \theta_{ikt} = \beta_{ikt} \eta_i \frac{\bar{q}_i}{\bar{p}_i} \]  

(8)

Where (8) is the relation that allows the identification of parameters of conduct estimated.

An additional question as far as the identification of parameters of conduct is concerned relates to indexes i, k, r and t. As in the data basis, there are 4 firms, 2 distribution channels, 7 regions and 18 time frames. The econometrist has in this case the impossible task to estimate 1008 parameters of conduct. The literature on NEIO solves this problem reducing the number of parameters to be estimated. In the present case, we should

\(^1\) Other brands considered in this segment, but not included in the analysis: Kaiser Pilsen, Bavaria Pilsen, Itaipava, Crystal, Frevo and Cintra.
consider as a matter of procedure a specific parameter for each (4), in each distribution channel (2), for each sample year (3) and for each region “Nilsen” (7). All together 168 parameters can be identified through this modeling proposal.

The final price equation (first-order condition) is under the following form:

\[ p_{ikrt} = \alpha_{0ik} + \alpha_{1ik} bim_t + \beta_{ik} q_{ikret} + \gamma_{ikr} ano_s + \gamma_{ikr} q_{ikret} reg_r \]  

Where: \( bim_t \) represents as dummies of bimonthly (7, base case: first bimonthly of 2001), \( ano_s \) represented as dummies of year (3, base case: 2001), and \( reg_r \) represents as dummies of region (7, base case: reg7).

As it can be analyzed in (9), we assume that the marginal cost of a certain brand contains two components: one effect that remains unchanged through time and regions, but which is brand specific in a determined distribution channel (\( \alpha_{0ik} \)), and an effect that changes with time, also specific of the brand and channel (\( bim_t \)). The use of fixed effects to control the variations of marginal cost is justified by the following reason: variables that shift costs at brand level are not noticeable by the econometrist in the present work and therefore the specific effects of the brand and of the bimonthly report work as a proxy to control the price changes, devaluation in the exchange affecting the purchase of imported items, changes not noticeable in the structure of plants and product composition etc.

Adding to the above in (9) we see that it is allowed that the conduct varies between brands, distribution channels, regions and or weather (annually). This allows the econometric model to capture the varied behavior in firms according to their regional strategy, changes through out the bi-monthly evaluations (by factors like increased competition, answer to supply shock etc.) and along the markets (self-service and bars).

To simplify nomenclature, it the following variable list was adopted in addition to the above referred dummies:

- \( psca = \) Average price of Nova Schin Pilsen, in self service;
- \( pska = \) Average price of Skol Pilsen, in self service;
- \( pbra = \) Average price of Brahma Chopp, in self service;
- \( pana = \) Average price of Antarctica Pilsen, in self service: (x100);
- \( pscb = \) Average price of Nova Schin Pilsen, in bars (x100);
- \( pskb = \) Average price of Skol Pilsen, in bars (x100);
- \( pbbr = \) Average price of Brahma Chopp, in bars (x100);
- \( pnb = \) Average price of Antarctica Pilsen, in bars (x100);
- \( qsca = \) volume of beer commercialized of Nova Schin Pilsen, in self service(in thousand of liters);
- \( qska = \) volume of beer commercialized of Skol Pilsen, in self service (in thousand of liters);
- \( qbra = \) volume of beer commercialized of Brahma Chopp, in self service(in thousand of liters);
- qana = volume of beer commercialized of Antarctica Pilsen, in self service (in thousand of liters);
- qscb = volume of beer commercialized of Nova Schin Pilsen, in bars (in thousand of liters);
- qskb = volume of beer commercialized of Skol Pilsen, in bars (in thousand of liters);
- qbrb = volume of beer commercialized of Brahma Chopp, in bars (in thousand of liters);
- qanb = volume of commercialized beer of Antarctica Pilsen, in bars (in thousand of liters);

With the aggregate of variables above defined, was than possible to make an estimate of eight price equations (first-order condition, as seen in the previous section). The estimated equations are as following:

\[
\begin{align*}
  psca &= \alpha_{011} + \alpha_{111} \cdot \text{bim}_1 + \beta_{111} \cdot \text{qsc} + \gamma_{111} \cdot \text{qsc} \cdot \text{ano}_s + \gamma_{211} \cdot \text{qsc} \cdot \text{reg}_r \\
  pska &= \alpha_{021} + \alpha_{121} \cdot \text{bim}_1 + \beta_{121} \cdot \text{qsk} + \gamma_{121} \cdot \text{qsk} \cdot \text{ano}_s + \gamma_{221} \cdot \text{qsk} \cdot \text{reg}_r \\
  pbra &= \alpha_{031} + \alpha_{131} \cdot \text{bim}_1 + \beta_{131} \cdot \text{qbr} + \gamma_{131} \cdot \text{qbr} \cdot \text{ano}_s + \gamma_{231} \cdot \text{qbr} \cdot \text{reg}_r \\
  pana &= \alpha_{041} + \alpha_{141} \cdot \text{bim}_1 + \beta_{141} \cdot \text{qan} + \gamma_{141} \cdot \text{qan} \cdot \text{ano}_s + \gamma_{241} \cdot \text{qan} \cdot \text{reg}_r \\
  pscb &= \alpha_{012} + \alpha_{112} \cdot \text{bim}_1 + \beta_{112} \cdot \text{qsc} + \gamma_{112} \cdot \text{qsc} \cdot \text{ano}_s + \gamma_{212} \cdot \text{qsc} \cdot \text{reg}_r \\
  pskb &= \alpha_{022} + \alpha_{122} \cdot \text{bim}_1 + \beta_{122} \cdot \text{qsk} + \gamma_{122} \cdot \text{qsk} \cdot \text{ano}_s + \gamma_{222} \cdot \text{qsk} \cdot \text{reg}_r \\
  pbrb &= \alpha_{032} + \alpha_{132} \cdot \text{bim}_1 + \beta_{132} \cdot \text{qbr} + \gamma_{132} \cdot \text{qbr} \cdot \text{ano}_s + \gamma_{232} \cdot \text{qbr} \cdot \text{reg}_r \\
  panb &= \alpha_{042} + \alpha_{142} \cdot \text{bim}_1 + \beta_{142} \cdot \text{qan} + \gamma_{142} \cdot \text{qan} \cdot \text{ano}_s + \gamma_{242} \cdot \text{qan} \cdot \text{reg}_r
\end{align*}
\]

The eight equations above were estimated through the use of technique 2SLS controlling the above described effects (FE-2SLS, minimal squares in two stages with fixed effects).

An important question relates to the used instrumental variables, since endogenous variables were defined and as such the estimate is subject to the called “bias of simultaneous equations”, known in text-books of econometrics. In the present work, the methodology indicated by Hausman, Leonard and Zona (1994), which defined, for example, as instrumental variable to a city the prices of other town. To the equations in (9), one has to define instruments towards the demanded quantities (q’s) through literature well known endogenous. However as a main critic to the approach of those authors is the existence of common and non noticeable shocks, mainly as a consequence of advertising at national level, it has been opted to follow it, but with caution not to deprive the potential instrument in 6 months (3 bi-monthly); adding to that the changed values of firms were used (for example: quantities of firm x with instruments for quantities of firm y, also with 3 by monthly of discrepancies) The idea of these techniques is that the same would turn the instruments less prone to correlate with residuals (ortogonality). Some tests of over
identifying restrictions were used and demonstrated favorable to the use of instruments so defined.

5. Analysis of Estimation Results

The results of the estimations of equation of first-order for profit maximizing, a methodology described in the previous sections, results that are presented in the appendix, allow that detailed interferences about the behavior of firms in the beer market. Subsections 5.1 and 5.2 below comment the results to the distribution channel for “self service” and “bars”, as well as present the parameters of conduct estimated for each firm in the year chosen.

5.1 Channel of Distribution Self Service- Cans of 350 ml

Table 1 presents conduct parameters estimated for the channel of distribution “self service”, for each firm in each region for years 2001, 2002 and 2003 (sample). The parameters were calculated from estimated equations in (10), results are in the appendix, and utilizing the relationship identification in (8), reproduced below using estimated values in (11):

\[
\hat{\sigma}_{ik} = \hat{\beta}_{ik} \frac{\eta_{ik}}{\bar{P}_{ik}}
\]

Where \(\hat{\sigma}_{ik}\), \(\hat{\beta}_{ik}\) and \(\hat{\eta}_{ik}\) are respectively the estimated conduct parameter, the estimated parameter of quantities and its own the estimated price-elasticity. Table 2 presents the estimated average considered of the parameters of conduct, calculated for each region and year shown. The estimated elasticity-price was obtained through the demand study AIDS in Oliveira (2004).
Table 1 – Conduct Parameters per Brand – Self-Service/Cans 350ml

<table>
<thead>
<tr>
<th>Region</th>
<th>Year</th>
<th>Schin / Nova Schin Pilsen</th>
<th>Skol Pilsen</th>
<th>Brahma Chopp</th>
<th>Antarctica Pilsen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region 01 - Northeast</td>
<td>2001</td>
<td>0.069 (0.067)</td>
<td>0.119 (0.063)</td>
<td>0.164 (0.127)</td>
<td>0.389 (0.114)</td>
</tr>
<tr>
<td></td>
<td>2002</td>
<td>-0.002 (0.035)</td>
<td>0.046 (0.048)</td>
<td>0.124 (0.149)</td>
<td>0.208 (0.079)</td>
</tr>
<tr>
<td></td>
<td>2003</td>
<td>-0.035 (0.032)</td>
<td>0.052 (0.063)</td>
<td>0.072 (0.105)</td>
<td>0.143 (0.076)</td>
</tr>
<tr>
<td>Region 02 - Rio de Janeiro</td>
<td>2001</td>
<td>-0.229 (0.077)</td>
<td>0.117 (0.033)</td>
<td>0.100 (0.103)</td>
<td>0.131 (0.183)</td>
</tr>
<tr>
<td>Hinterland, Minas Gerais</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>and Espírito Santo</td>
<td>2002</td>
<td>-0.175 (0.040)</td>
<td>0.044 (0.020)</td>
<td>0.033 (0.114)</td>
<td>-0.074 (0.148)</td>
</tr>
<tr>
<td></td>
<td>2003</td>
<td>-0.196 (0.038)</td>
<td>0.050 (0.030)</td>
<td>0.009 (0.081)</td>
<td>-0.133 (0.140)</td>
</tr>
<tr>
<td>Region 03 - Greater</td>
<td>2001</td>
<td>-0.738 (0.135)</td>
<td>0.226 (0.053)</td>
<td>0.039 (0.305)</td>
<td>0.340 (0.197)</td>
</tr>
<tr>
<td>Metropolitan Rio de Janeiro</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2002</td>
<td>-0.469 (0.075)</td>
<td>0.146 (0.038)</td>
<td>-0.054 (0.402)</td>
<td>0.154 (0.166)</td>
</tr>
<tr>
<td></td>
<td>2003</td>
<td>-0.471 (0.069)</td>
<td>0.176 (0.052)</td>
<td>-0.051 (0.278)</td>
<td>0.090 (0.157)</td>
</tr>
<tr>
<td>Region 04 - Greater</td>
<td>2001</td>
<td>-0.293 (0.132)</td>
<td>0.005 (0.050)</td>
<td>0.050 (0.075)</td>
<td>-0.088 (0.126)</td>
</tr>
<tr>
<td>Metropolitan São Paulo</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2002</td>
<td>-0.211 (0.073)</td>
<td>-0.060 (0.036)</td>
<td>-0.039 (0.074)</td>
<td>-0.313 (0.079)</td>
</tr>
<tr>
<td></td>
<td>2003</td>
<td>-0.231 (0.066)</td>
<td>-0.078 (0.049)</td>
<td>-0.040 (0.054)</td>
<td>-0.368 (0.074)</td>
</tr>
<tr>
<td>Region 05 - São Paulo</td>
<td>2001</td>
<td>-0.034 (0.071)</td>
<td>0.061 (0.031)</td>
<td>0.075 (0.060)</td>
<td>-0.102 (0.138)</td>
</tr>
<tr>
<td>Hinterland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2002</td>
<td>-0.062 (0.039)</td>
<td>-0.009 (0.018)</td>
<td>-0.003 (0.052)</td>
<td>-0.328 (0.093)</td>
</tr>
<tr>
<td></td>
<td>2003</td>
<td>-0.091 (0.035)</td>
<td>-0.014 (0.027)</td>
<td>-0.015 (0.040)</td>
<td>-0.383 (0.089)</td>
</tr>
<tr>
<td>Region 06 - South</td>
<td>2001</td>
<td>0.335 (0.108)</td>
<td>0.172 (0.044)</td>
<td>0.265 (0.134)</td>
<td>0.224 (0.121)</td>
</tr>
<tr>
<td></td>
<td>2002</td>
<td>0.151 (0.060)</td>
<td>0.095 (0.030)</td>
<td>0.267 (0.158)</td>
<td>0.028 (0.082)</td>
</tr>
<tr>
<td></td>
<td>2003</td>
<td>0.108 (0.055)</td>
<td>0.114 (0.041)</td>
<td>0.171 (0.111)</td>
<td>-0.033 (0.079)</td>
</tr>
<tr>
<td>Region 07 - Center-West</td>
<td>2001</td>
<td>0.586 (0.245)</td>
<td>0.221 (0.040)</td>
<td>0.615 (0.261)</td>
<td>0.726 (0.230)</td>
</tr>
<tr>
<td></td>
<td>2002</td>
<td>0.296 (0.136)</td>
<td>0.142 (0.026)</td>
<td>0.767 (0.369)</td>
<td>0.577 (0.198)</td>
</tr>
<tr>
<td></td>
<td>2003</td>
<td>0.243 (0.126)</td>
<td>0.171 (0.063)</td>
<td>0.514 (0.255)</td>
<td>0.505 (0.188)</td>
</tr>
</tbody>
</table>

Note: ‡, † e *: significant at the level 1%, 5% e 10%, respectively

2 The conduct parameters are to be interpreted as following: the competition as well as firm posture in a determined brand increases at the lower price ranges. Numbers closer to zero mean a strategy of “marginal-cost pricing”, translating into intense competition, being this a market with a differentiated product. The same applies to negative values. Suspicions of predation occur over low conduct parameter, combined with high market share (of the group).
A more detailed analysis of the values presented in tables 1 and 2 allow a reasonable understanding of the competitive process in the can beer market in the Brazilian supermarkets. The main issues to be pointed out are as following:

- **Long-term conduct:** We observed that the year 2002 e 2003 presented increased competition (significant drop in the parameters of conduct, having as a consequence lower profit margins). The drop started in 2002 and can be attributed to that year’s exchange devaluation, translating into higher import costs of goods without being able to pass through the increased cost to consumers. In 2003 there are, in a majority of cases, situations of higher competitiveness than in 2002, reflecting in increased rivalry in the market (price wars), specially because that was of bad year of performance for the Brazilian economy as a whole and particularly for the beer market.

- **Regional Conduct:** In general we observed that in regions 4 and 5 (that includes all of Sao Paulo State) are the most competitive, with reduced conduct parameters and in general negative, regions 6 and 7 (South and Center-West) present higher profit margins and less competitive conduct. It is important to underline at the same time that in all cases the estimated parameters are below the reference value $\theta = 1$ (balance of Bertrand-Nash), meaning a higher tendency for increased competition ($\theta<1$) than just collusion ($\theta>1$).

- **Conduct between brands:** *Ceteris paribus*, Skol Pilsen’s brand is the one with the least conduct parameters, since it has the lowest coefficient of estimated quantities $\beta$. It is important to observe that the Antartica brand has shown excessively competitive behavior in the important regions of Sao Paulo State, with values always lower than other brands (what we strongly note does not occur in other regions); In fact, the estimated conduct parameters for Antartica in regions 4 and 5 are way lower than in other regions and are negative. To this fact we can add that the analysis of standards of substitution and complementation between brands (study of demand in Oliveira, 2004) indicate the higher tendency for the use of the
same brand (Antartica) as fighting brand. Considering the high market share of AMBEV’S market (owner of the Antarctica brand) in those regions and throughout the national market, we can demonstrate strong evidence of predatory pricing practices in those regions for the channel of self-service.

5.2 Channel of Distribution Bars – Bottles of 600 ml

Tables 3 and 4 present conduct parameters for distribution channel “bars” by firm and for each region for the years 2001-2003, as well as their respective average values. The main points of the analysis of conduct in the distribution channel are as following:

- **Long-Term Conduct**: In this distribution channel we also observed a considerable rivalry increase in the markets, but in general the parameters of conduct in this channel were superior against the “self service”. This occurs because of the fact that the price-elasticity in the “bars” is higher that in the “self service”, as shown in Oliveira (2004). This way with lower price-elasticity there is a smaller incentive for engaging in increased. In any case, the strongly increased fall in the parameters in 2002 is again as a consequence of the exchange devaluation. The fall in 2003 was not as dramatic but did lead in the majority of cases to situations of higher competitiveness than in the previous year.

- **Regional Conduct**: In general regions 1, 2 and 5 are the most competitive, with smaller conduct parameters than other regions and eventually negative or closer to zero. Again we have in regions 6 and 7 (South and Midwest) less aggressive conduct parameter and in some cases with values way \( \theta = 1 \). An example would be Brahma in the Midwest, in 2001-2002, what could be indicative of equivalent or collusive behavior. This type of behavior in his case, would indicate that AMBEV could have opted to exercise, its market power as a dominant firm, keeping its profit margins more or less high for its brands--, according with the particularities and intensity of the competition in the different regional markets. However we have again in the majority of cases, a way to observe the estimated parameters below the balance of Bertrand-Nash;

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3 Text in Oliveira (2004): “(...) in particular and having as a base the behavior of the average consumer, the following brands could be considered complimentary brands: Antartica-Brahma and Nova Schin-Antartica, Kaiser-Skol. It is relevant to mention that when there is synergy between other brands that belong to the same firm (ex: Antartica-Brahma, with relation to AMBEV), it can be of more advantage for the same firm to use from this portfolio to create a “combat brand” (choosing between them probably the one that has the least loyalty-measured through elasticity-pricing, to compete in pricing as much against the competitors as against the new comers) we notice than a synergy that can be detrimental to the competition” In the present case (channel of distribution “self-service”), Antartica has more elasticity-pricing than Brahma.

4 It is important to notice that the conduct of Schincariol in some markets has also been negative. This should not be interpreted as anti competitive practice, since its participation in the market during the period of this study, was reduced to less than 10%. Smaller firms can have difficulties to be positioned in some regional markets, like having better ways to display their products, something that would face them in a position to be extremely competitive as a way to survive. The case of AMBEV is clearly distinct, since the largest market share of the group as a whole, and also because of its brands individually considered, as well as the lowest elasticity-pricing associated with its products (Oliveira, 2004), places it in a natural position to exercise dominance, market as well as predatory power.
Conduct among brands: Again and ceteris paribus, the brand Skol Pilsen is the brand with lowest estimated quantity coefficient $\beta$ (see Appendix 6.5-6.8). Additionally, this brand represents estimated conduct parameters consistently lower (closer to zero in some cases) than all the other brands in the AMBEV portfolio. This behavior cannot be considered normal competition, since it relates to the leading market brand, with approximately 35% of the volume in sales (average sample). To his act add the analysis of patterns of possible substitution and complementation between brands (study of demand in Oliveira 2004), they also indicate a higher inclination to use of Skol in possible predatory practices: “In the case of the AMBEV brands, we have again an exception to the standard of synergy, this time between Skol and Antartica (the two brands with highest levels consumer loyalty) jumping at us in terms of the “fighting brand” question, potentially negative to the competition” (Oliveira, 2004). Noticing that in the present case (distribution channel “bares”), Skol has estimated own-price elasticity higher than Antarctica.
### Table 3 – Conduct Parameters – Bars/600ml

<table>
<thead>
<tr>
<th>Region</th>
<th>Year</th>
<th>Schin / Nova Schin Pilsen</th>
<th>Skol Pilsen</th>
<th>Brahma Chopp</th>
<th>Antarctica Pilsen</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Region 01 – Northeast</strong></td>
<td>2001</td>
<td>0.213 (0.048)</td>
<td>0.045 (0.017)</td>
<td>0.213 (0.063)</td>
<td>0.073 (0.014)</td>
</tr>
<tr>
<td></td>
<td>2002</td>
<td>0.110 (0.020)</td>
<td>-0.051 (0.013)</td>
<td>0.156 (0.059)</td>
<td>0.035 (0.008)</td>
</tr>
<tr>
<td></td>
<td>2003</td>
<td>0.090 (0.017)</td>
<td>-0.077 (0.012)</td>
<td>0.111 (0.031)</td>
<td>0.042 (0.008)</td>
</tr>
<tr>
<td><strong>Region 02 - Rio de Janeiro Hinterland, Minas Gerais, Espírito Santo</strong></td>
<td>2001</td>
<td>0.078 (0.077)</td>
<td>0.033 (0.11)</td>
<td>0.304 (0.097)</td>
<td>0.235 (0.048)</td>
</tr>
<tr>
<td></td>
<td>2002</td>
<td>0.043 (0.034)</td>
<td>-0.001 (0.009)</td>
<td>0.239 (0.072)</td>
<td>0.118 (0.026)</td>
</tr>
<tr>
<td></td>
<td>2003</td>
<td>0.031 (0.030)</td>
<td>-0.032 (0.008)</td>
<td>0.153 (0.037)</td>
<td>0.105 (0.021)</td>
</tr>
<tr>
<td><strong>Region 03 - Greater Metropolitan Rio de Janeiro</strong></td>
<td>2001</td>
<td>0.052 (0.132)</td>
<td>0.049 (0.012)</td>
<td>1.002 (0.330)</td>
<td>0.298 (0.046)</td>
</tr>
<tr>
<td></td>
<td>2002</td>
<td>0.031 (0.061)</td>
<td>0.010 (0.010)</td>
<td>0.875 (0.284)</td>
<td>0.151 (0.025)</td>
</tr>
<tr>
<td></td>
<td>2003</td>
<td>0.020 (0.053)</td>
<td>-0.023 (0.009)</td>
<td>0.477 (0.145)</td>
<td>0.130 (0.020)</td>
</tr>
<tr>
<td><strong>Region 04 - Greater Metropolitan São Paulo</strong></td>
<td>2001</td>
<td>0.463 (0.130)</td>
<td>0.124 (0.039)</td>
<td>0.313 (0.072)</td>
<td>0.314 (0.037)</td>
</tr>
<tr>
<td></td>
<td>2002</td>
<td>0.234 (0.060)</td>
<td>0.058 (0.027)</td>
<td>0.247 (0.048)</td>
<td>0.160 (0.020)</td>
</tr>
<tr>
<td></td>
<td>2003</td>
<td>0.198 (0.052)</td>
<td>0.020 (0.024)</td>
<td>0.157 (0.026)</td>
<td>0.136 (0.017)</td>
</tr>
<tr>
<td><strong>Region 05 - São Paulo Hinterland</strong></td>
<td>2001</td>
<td>0.040 (0.062)</td>
<td>-0.003 (0.016)</td>
<td>0.292 (0.067)</td>
<td>0.295 (0.056)</td>
</tr>
<tr>
<td></td>
<td>2002</td>
<td>0.025 (0.026)</td>
<td>-0.024 (0.012)</td>
<td>0.228 (0.063)</td>
<td>0.149 (0.030)</td>
</tr>
<tr>
<td></td>
<td>2003</td>
<td>0.015 (0.023)</td>
<td>-0.053 (0.011)</td>
<td>0.148 (0.033)</td>
<td>0.129 (0.024)</td>
</tr>
<tr>
<td><strong>Region 06 - South</strong></td>
<td>2001</td>
<td>0.477 (0.163)</td>
<td>0.199 (0.020)</td>
<td>0.975 (0.209)</td>
<td>0.353 (0.045)</td>
</tr>
<tr>
<td></td>
<td>2002</td>
<td>0.241 (0.077)</td>
<td>0.108 (0.015)</td>
<td>0.851 (0.173)</td>
<td>0.179 (0.024)</td>
</tr>
<tr>
<td></td>
<td>2003</td>
<td>0.204 (0.087)</td>
<td>0.063 (0.014)</td>
<td>0.464 (0.089)</td>
<td>0.151 (0.020)</td>
</tr>
<tr>
<td><strong>Region 07 - Center West</strong></td>
<td>2001</td>
<td>1.083 (0.299)</td>
<td>0.190 (0.024)</td>
<td>1.609 (0.410)</td>
<td>0.599 (0.074)</td>
</tr>
<tr>
<td></td>
<td>2002</td>
<td>0.531 (0.143)</td>
<td>0.102 (0.018)</td>
<td>1.429 (0.356)</td>
<td>0.306 (0.039)</td>
</tr>
<tr>
<td></td>
<td>2003</td>
<td>0.457 (0.125)</td>
<td>0.058 (0.016)</td>
<td>0.758 (0.182)</td>
<td>0.247 (0.031)</td>
</tr>
</tbody>
</table>

Note: ‡, † e *: significant at the level of 1%, 5% and 10%, respectively.

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5 Please see interpretation of conduct parameters on footnote referring to table 1.
Table 4 – Average Conduct Parameters – Bars/600ml

<table>
<thead>
<tr>
<th>Region</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region 01</td>
<td>0.122</td>
<td>0.066</td>
<td>0.035</td>
<td>0.075</td>
</tr>
<tr>
<td>Region 02</td>
<td>0.146</td>
<td>0.087</td>
<td>0.040</td>
<td>0.091</td>
</tr>
<tr>
<td>Region 03</td>
<td>0.205</td>
<td>0.133</td>
<td>0.068</td>
<td>0.139</td>
</tr>
<tr>
<td>Region 04</td>
<td>0.292</td>
<td>0.200</td>
<td>0.132</td>
<td>0.202</td>
</tr>
<tr>
<td>Region 05</td>
<td>0.148</td>
<td>0.094</td>
<td>0.053</td>
<td>0.100</td>
</tr>
<tr>
<td>Region 06</td>
<td>0.450</td>
<td>0.315</td>
<td>0.192</td>
<td>0.316</td>
</tr>
<tr>
<td>Region 07</td>
<td>0.600</td>
<td>0.403</td>
<td>0.243</td>
<td>0.426</td>
</tr>
<tr>
<td>Mean</td>
<td>0.231</td>
<td>0.149</td>
<td>0.088</td>
<td>0.156</td>
</tr>
</tbody>
</table>

6. Conclusion

The present work aimed to present inferences of the recent competitive conduct of beer brands in Brazil. Through the approach of the New Empirical Industrial Organization, we tried to estimate behavior models mentioned in theory of games, in a way to promote a better understanding of the competition in this important market.

The organization of brewing industry indicates the existence of room for entry of new firms in market niches, especially in the low-price market, be that locals, or just by product segments, even so when the market leader adopts in a sustainable way conduct of raising prices. The timing of this study coincided with the entering of new brands and growth of the already established competitive brands. This competitive dynamic explains the rationality of temporary abandonment of profit maximizing in the short run, with the adoption, by the dominant firm, of practices of discipline and exclusion of competitors.

From the analysis of estimated parameters of conduct, we found evidence of super competitive behavior from Antartica (“self service”) and Skol (“bars”), inside AMBEV’s portfolio. This extremely competitive behavior has a high probability of being detrimental to the competition, in the form of predatory pricing, since most likely has the deliberate intention to create damage to rival brands in specific regional markets, taking advantage of having more market power than the group (bigger market share, share the exposure, numeric and controlled distribution etc). As evidence of the above, we have in some cases the proximity of the reference prices to marginal cost, indicating in some cases an incompatible behavior within markets of differentiated products.
7. References


