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STRATEGIC ENTRY DETERRENCE: PIONEER FOODS AND THE BREAD CARTEL

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ABSTRACT

Joseph Harrington studies whether cartel members can sustain cooperation over time under the threat of free entry in an infinitely repeated game and shows that firms can deter entry by credibly threatening to meet any entry with an episode of below-cost pricing. In this article, we provide direct evidence of predation through below-cost pricing in the cartelized South African bread industry by comparing prices to average variable costs. We find evidence of episodes of predatory pricing. While the Competition Commission case was settled before adjudication by the Competition Tribunal, Pioneer Foods admitted to the strong evidence of predatory intent and that its conduct impeded small independent bakeries from expanding within the market and competing effectively as part of the settlement agreement.

JEL: L13; L40; L41; L66

I. INTRODUCTION

Predatory pricing is an exclusionary conduct in which the predatory firm sacrifices short-run profits in order to achieve long-run gains, and in doing so causes rivals to exit and reduces social welfare. On the one hand, predatory pricing can be anticompetitive, while on the other hand, price reductions are the essence of competition. The debate on predatory pricing has been highly contested and has intrigued the competition policy community for more than a century. Some still argue that predatory pricing is as rare as dragons.[1] Modern explanations of predatory pricing are mostly about asymmetric information, and these explanations are also about a monopoly

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[1] *See* Frank H. Easterbrook, *Predatory Strategies and Counterstrategies*, 48 U. CHI. L. REV. 263 (1981).

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excluding weaker rivals.[2] A notable exception to this literature is Joseph Harrington, who studied collusion and predation under free entry.[3]

In December 2007, the Competition Commission ("Commission") received a complaint from Mossel Bay Bakery. Mossel Bay Bakery alleged that Sasko-owned Pioneer Foods (Pty) Ltd engaged in predatory pricing. Mossel Bay Bakery alleged further that Sasko threatened it with price wars if it did not increase its price of bread. Mossel Bay Bakery also alleged that Pioneer Foods baked bread 300 kilometers away in Worcestor and transported it to Mossel Bay, but sold its bread at a cheaper price in Mossel Bay than in Worcestor in an attempt to drive Mossel Bay Bakery out of the market. If true, the alleged conduct could be in contravention of section 8 (c) (dealing with anticompetitive general exclusionary conduct) or 8 (d) (iv) (dealing with anticompetitive below average variable cost pricing) of the Competition Act of 1998, as amended ("Competition Act").

In February 2010, after contested proceedings, the Competition Tribunal found that Pioneer Foods had been involved in a conspiracy to fix the prices of bread as well as market allocation in the Western Cape province and nationally. Further, while the Commission alleged that Pioneer Foods had engaged in anticompetitive predatory pricing in several towns in Western Cape, Pioneer Foods admitted in November 2010 that this conduct impeded small independent bakeries from expanding within the market and competing effectively, in contravention of section 8 (c) of the Competition Act as part of the Pioneer Foods consent and settlement order concluded by the Competition Tribunal ("Tribunal").[4]

This article explores the relationship between strategic entry deterrence and the ability of colluding firms to maintain cartel profits in the presence of entry threats. Using Pioneer Foods' admission to having engaged in predatory price wars, the article focuses on the following questions. First, how did Pioneer Foods and the bread cartel respond to entry? Second, how effective was Pioneer Foods' conduct in maintaining the collusion under the threat of entry? This article is organized as follows: Part II provides background information of the bread industry, and in particular the bread cartel in the Western Cape. Part III outlines the relevant legislation for dealing with predatory pricing complaints, and Part IV presents a model and discusses the results. Part 5 concludes.

[2] For a survey of this literature, see Bruce Kobayashi, *The Law and Economics of Predatory Pricing*, *in* ANTITRUST LAW AND ECONOMICS 116 (Keith N. Hylton ed., Edward Elgar 2010); Janusz A. Ordover & Garth Saloner, *Predation, Monopolization, and Antitrust*, *in* 1 HANDBOOK OF INDUSTRIAL ORGANIZATION 538 (Richard Schmalensee & Robert D. Willig eds., North-Holland 1989).

[3] Joseph Harrington, *Collusion and Predation Under (Almost) Free Entry*, 7 INT'L J. INDUS. ORG. 381 (1989).

[4] *See* Tembinkosi Bonakele & Liberty Mncube, *Designing Appropriate Remedies for Competition Law Enforcement: The Pioneer Foods Settlement Agreement*, 8 J. COMPETITION L. & ECON. 425 (2012).

II. THE BREAD INDUSTRY: A HISTORICAL BACKGROUND

A. Background

The bread industry was extensively regulated until March 31, 1991. Through legislation, a quota system was established, product specifications (such as weight, height, and width per loaf) were prescribed, prices at which bread was sold were set, and volumes to be produced and distribution areas for each producer were determined. Bread prices were subsidized by Government and there was no value added tax on bread. In this environment, there were approximately 370 bakeries country wide, which included the four largest national bakeries and smaller independent bakeries.

During the regulated period, regular meetings took place between bread producers largely, although not exclusively, under the auspices of the Chamber of Baking, to whom all of the bakers belonged. Bread producers discussed various issues including circumstances where producers were encroaching on each other's allocated areas and producers exceeding their volumes and the compensation that those violating the agreements were obliged to pay.[5] A culture of cooperation and information sharing on prices, volume, and market allocation was entrenched in the industry over many decades. Market participants knew the price of bread (determined by Government), each other's distribution territory, and volumes sold by the various producers.

With deregulation, the legislative impediment to competition was removed. However, bread producers continued their interactions with regard to common issues such as labor and missing bread crates. The Chamber of Baking also continued as a forum for sharing information on the industry where issues such as deliveries of wheat, quality of wheat, unscrupulous bakers, and security concerns were discussed freely and legitimately. Deregulation allowed for the growth in smaller and in-store bakeries. This, together with the removal of prescribed delivery zones and routes and production quotas put pressure on the major plant bakeries' costs per unit.

There are four primary bakeries that altogether enjoy a market share of between 50 to 60 percent of the domestic bread market in South Africa.[6] The remainder of the market is served by smaller independent bakeries. The four primary plant bakeries are all vertically integrated. Their milling operations account for more than 90 percent of all milled wheat. As milling companies, they sell flour to the independent bakeries. Plant bakeries and independent bakeries produce similar products and are competitors to each other.

[5] In addition, they discussed production issues, such as the supply and quality of ingredients, and labor issues.

[6] Blue Ribbon Bakeries, owned by Premier Foods; Albany Bakeries, owned by Tiger Consumer Brands; Sasko and Duens Bakeries, owned by Pioneer Foods; and Sunbake Bakeries, owned by Foodcorp.

Wheat flour is the main ingredient used to bake bread. The cost of wheat constitutes approximately 41 percent of the cost per loaf of bread. The bakeries' bread recipes are similar, since they contain the same ingredients. The costs of operating a plant bakery are also comparable, as are the costs of distribution, which is mainly driven by fuel prices. The bakeries' input costs essentially comprise wheat flour, fuel, and labor, and are therefore similar and subject to the same price fluctuations. Customers tend to be classified into three categories (retail, general trade, and agents). Retail customers are the large retail groups. The general trade comprises smaller entities such as spaza shops, cafes, and smaller retailers, and the final category includes a variety of agents, such as resellers and independent distributors. The largest single class of bread buyers is the large retail customers who purchase approximately 30 percent of the plant bakeries' production.

Plant bakeries set their prices nationally. Pioneer Foods sells its bread to distributors and retailers at a discount or rebate off the list price. The list price is therefore not the actual price paid by the customer. Once the list price is determined, Pioneer Foods, in common with the practice employed by its competitors, informs its various retail customers of the change in price. Pioneer Foods' national sales managers, who are responsible for the actual bread prices for the national key accounts, which are the large supermarket chains, forecourts, and convenience franchises, meet with the respective buyers of these important retailers in order to communicate the price adjustment and, critically, to negotiate discounts before the net price is loaded on to the large retailers' systems. Increases to the general trade customers and distributors are communicated in a letter, usually delivered together with the bread.

Pioneer Foods' bakery managers are responsible for determining the actual bread price for smaller customers, local supermarkets, convenience stores, and distributors, and will take regional competition into consideration when determining the bread price. The primary plant bakeries in the Western Cape province collectively account for approximately 60 percent of bread sales, and they include Tiger Brands, Pioneer Foods, and Premier Foods.

B. The Bread Cartel

In December 2006, the Commission received information of an alleged bread cartel operating in the Western Cape province. Following a preliminary investigation, the Commission initiated a complaint against Premier Foods, Tiger Brands, and Pioneer Foods, all of whom allegedly had been involved in a bread cartel.

During the Commission's investigation into the Western Cape complaint, Premier Foods applied for leniency, indicating its willingness to fully cooperate with the Commission on its role in the bread cartel. Premier Foods disclosed to the Commission that it was a member of a bread cartel together with Tiger Brands and Pioneer Foods, fixing selling prices and other trading conditions. Premier Foods also revealed that the bread cartel operated in other parts of the country and that the cartel allocated markets. Cartel agreements were used to secure coordination at both national and regional levels, and were mutually reinforcing. Based on this information, the Commission proceeded to initiate a second investigation into the allegation that a bread cartel operated in other parts of the country.

Tiger Brands followed Premier Foods and corroborated the information provided by Premier Foods. Tiger Brands provided further evidence on the bread cartel, including additional information that the bread cartel was also fixing flour and maize meal prices. On November 28, 2007, the Tribunal imposed a fine of 98 million rand on Tiger Brands for its role in the bread cartel. This represented about 5.7 percent of its turnover from baking for the financial year 2006. Foodcorp, a respondent in the national complaint, entered into a settlement agreement with the Commission and on January 6, 2009, the Tribunal confirmed the settlement agreement and imposed a fine of 45 million rand on Foodcorp. This represented 6.7 percent of its turnover for baking operations for the financial year 2006. Pioneer Foods, however, at this stage, denied that it was involved in a Western Cape cartel. After contested proceedings and on February 3, 2010, the Tribunal ruled that Pioneer Foods had engaged in fixing the price of bread products in the Western Cape province and nationally, imposing on Pioneer Foods a fine of R196 million.

Pioneer Foods conceded that it had, in respect of the Western Cape complaint, acted in contravention of section 4(1) (b) of the Competition Act (this section prohibits collusion). This concession only came at the end of the hearings during legal argument. Pioneer Foods admitted that it cooperated with its competitors in fixing the price of the discount granted to the agents or resellers and in fixing the price of toaster bread. It admitted to market sharing arrangements.

Up until the Chamber of Baking was disbanded in 2002, meetings of the local chapter of the Chamber took place regularly in the Western Cape. These were chaired by Pioneer Foods. It was common practice for the participants to discuss pricing issues after the conclusion of the official business of the meetings. With the disbandment, informal meetings continued to be convened every 4 to 5 months to discuss, *inter alia*, price increases, the timing thereof, and discounts to agents. Agreements that arose from these informal meetings were sometimes not honored. Cheating generally occurred when granting confidential discounts, particularly to the large retailers. This generated a retaliatory response from the other cartelists, thus reducing the net margin gained from an agreed increase.

Informal meetings were discontinued after a meeting held in October 2003 broke up in considerable acrimony precisely because of perceptions of cheating on pricing agreements. However, *ad hoc* contact between representatives of the plant bakery continued even after these informal "post-chamber" meetings had been terminated. For example in December 2006, Premier Foods, Pioneer Foods and Tiger Brands contravened section 4 (1) (b) (i) and (ii) of the Competition Act,[7] in that they met and agreed that: (1) All three firms would increase the discounted price of toaster bread on February 5, 2007 to realize 4.25 rand per loaf including tax; (2) All three firms would increase the price of the standard loaf of bread by 35 cents per loaf from December 18, 2006; (3) The dates by which the bread price increases were to be implemented would be staggered so as not to be implemented on the same date; (4) Discounts given by all three firms to agents in the Paarl area would be capped at 90 cents and 75 cents for agents in the Cape Peninsula; (5) None of the firms would supply new distributors; (6) None of the firms would supply each other's former employees; and (7) None of the firms would make bread deliveries on December 25 and 26, 2006.

The Tribunal found that, indeed, Pioneer Foods had been involved in a conspiracy to fix the increase of the price of a standard loaf of bread in the Western Cape as well as the timing of this increase. In addition to Pioneer Foods' concessions regarding the fixing of the agents' commissions and the various market allocations, the Tribunal found that Pioneer Foods' conduct amounted to a comprehensive contravention of Section 4(1) (b) (i) and (ii) of the Competition Act.

III. RELEVANT LEGISLATION

Legal rules in competition policy are aimed at minimizing the sum of direct costs and error costs.[8] Error costs include the costs of type I and type II errors. Type II errors include allowing anticompetitive predatory pricing while type I errors include falsely labeling price cuts as anticompetitive when in fact they are welfare increasing or deterring efficient price competition from occurring in the first place. Phillip Areeda and Donald F. Turner provide the seminal article on the cost-based test applied to predatory pricing cases.[9] Their work is premised on the observation that in perfectly competitive markets, price equals short-run marginal cost. Areeda and Turner propose that prices above short-run marginal cost are lawful, while prices below short-run marginal cost are unlawful. The short-run period is suggested because a firm does not change production assets. However, it is difficult to observe, let alone measure, marginal cost. Areeda and Turner

[7] These two sections prohibit price fixing and market allocation, respectively.

[8] David S. Evans & Atilano Jorge Padilla, *Designing Antitrust Rules for Assessing Unilateral Practices: A Neo-Chicago Approach*, 72 UNI. CHI. L. REV. 73 (2005); RICHARD POSNER, ECONOMIC ANALYSIS OF LAW (6th ed., Aspen Publishers 2002).

[9] Phillip Areeda & Donald F. Turner, *Pricing and Related Practices Under Section 2 of the Sherman Act*, 88 HARV. L. REV. 697 (1975).

suggest the use of average variable cost ("AVC") as a more easily observable proxy. In which case, prices below AVC would be presumptively unlawful.

According to Areeda and Turner, a price below AVC is irrational for a profit-maximizing firm, whereas a price above AVC is, in the short-run at least, sustainable and therefore a reasonable benchmark for a legitimate price. The implicit assumption here is the argument that competition law should only protect firms who are at least as efficient as the dominant firm. The Areeda and Turner test has had a major influence on predatory pricing laws in many developing and developed countries, including South Africa. In Europe, the European Court of Justice ("ECJ") framed the Areeda and Turner test in its AKZO decision in the following manner:[10] (1) Prices set by a dominant firm below its average variable costs are presumed abusive; (2) Prices above average variable costs but below average total costs are abusive if they are intended to eliminate a competitor; and (3) Prices above average total costs are conclusively legal.

Because of problems with the classification of fixed and variable costs, the allocation of common fixed and variable costs between two or more products, and developments in economic thinking, have led others to propose certain modifications to the Areeda and Turner test. Miguel de la Mano and Benoît Durand argue for a three-step structured rule of reason to establish a presumption that the observed practice is predatory—that is:[11] (1) The sacrifice of short-run profits (actual sacrifice); (2) The negative impact on rival profitability, which may induce a prey to exit, reduce its scale, or stay out of the "sacrifice" market or closely related markets (likely exclusion); and (3) The ability to recoup the initial profit sacrifice by exercising increased market power after the predatory phase (likely recoupment).

In December 2008, the European Commission issued its guidance paper on enforcement priorities in applying Article 82 EC to exclusionary conduct by dominant firms ("Guidance Paper"). According to the Guidance Paper, pricing below average avoidable cost ("AAC") is a clear evidence of sacrifice. AAC involves comparing the incremental cost of remaining in the market with the avoidable cost of exiting it. A rational firm would not sell below its AAC. It makes more economic sense for firm to exit the market, if avoidable costs exceed the incremental costs.

The AAC test has the advantage of not requiring the identification of fixed and variable costs. While the AAC overcomes some challenges associated with the Areeda and Turner test, it can raise significant practical

[10] Case C-62/86, AKZO Chemie BV v. Comm'n, 1991 E.C.R. I-3359 ¶¶ 70–73 (holding that above variable cost but below total cost pricing is illegal if intended to eliminate a competitor).

[11] Miguel De la Mano & Benoît Durand, *A Three-Step Structured Rule of Reason to Assess Predation Under Article 82* (Discussion Paper, Office of the Chief Economist, DG Competition, European Commission, Dec. 12, 2005), *available at* http://ec.europa.eu/dgs/competition/economist/pred_art82.pdf.

problems. First, the AAC test does not avoid the difficulty under the Areeda and Turner test of defining the appropriate time period over which avoidable costs should be identified. Second, some assets are transferable assets between markets. Assets that can be transferred between markets result in much larger avoidable costs that those which cannot. Third, demand complementarity means that prices that are below AAC may be recovered if the loss-leading sales generate follow-on revenues in other, higher-margin products. Fourth, a dominant firm could minimize losses by reducing sales and charging a higher price than by exiting. Finally, considerable accounting problems may arise in measuring avoidable costs.

The Guidance Paper suggests that pricing above AAC but below long-run average incremental cost (LRAIC) may be also viewed as abusive under specific circumstances. Recoupment is not expressly mentioned, although the Guidance Paper states that consumers are likely to be harmed where the dominant firm is, as a result of its conduct, "likely to be in a position to benefit from the sacrifice." This appears to imply that a possibility of recoupment is required under the Guidance Paper's predation test. The differences between the Guidance Paper and the U.S. test for predation under Brooke Group case is that the U.S. test captures only pricing below average variable cost, whereas the Guidance Paper focuses on sacrifice; and while probability of recoupment is required in the United States, a mere possibility is sufficient under the Guidance Paper.[12]

In the case of the South African competition law regime, the relevant applicable sections of the Competition Act under which allegations of predatory pricing by a dominant firm are assessed include section 8 (c) and section 8 (d) (iv). Section 8 (c) prohibits a dominant firm from engaging in exclusionary conduct defined in general terms, with no penalty for a first contravention and with the onus on the complainant to demonstrate that the anticompetitive effect outweighs its technological, efficiency, or other procompetitive benefits. An exclusionary act is defined as that which impedes or prevents a firm entering into, or expanding within, a market. Section 8 (d) identifies particular types of exclusionary acts that are prohibited as an abuse of dominance, and where a penalty may be imposed for a first contravention, and where the onus is on the respondent to demonstrate that the anticompetitive effect outweighs its procompetitive benefits. The types of conduct specified under section 8 (d) include selling goods or services below their marginal or average variable cost in section 8 (d) (iv).

In the Nationwide/SAA case, the Tribunal set out the test for predatory pricing.[13] First, the Tribunal argued that the complainant must establish

[12] Brooke Group Ltd. v. Brown & Williamson Tobacco Corp., 509 U.S. 209 (1993).

[13] Competition Tribunal, *Decision on Application for Interim Relief In Terms of Section 59*, Case No. 92/IR/Oct00, *available at* http://www.comptrib.co.za/assets/Uploads/Case-Documents/92IROCT00.pdf.

that the respondent is pricing below cost for a sustained period and that this price-cost relationship need not be the one referred to in 8 (d) (iv) but should have some support in the literature as an appropriate measure of costs. Second, the Tribunal stressed the need for some additional evidence of predation. The Tribunal further stated that if the complainant is relying on the provisions under section 8 (c) and can show that the respondent costs are below some other appropriate measure of costs, it may prevail, provided that it adduces additional evidence of predation beyond mere evidence of recoupment.

IV. COLLUSION AND PREDATION

Joseph Harrington studies whether cartel members can sustain cooperation over time in a perfect-information, infinitely repeated game under the threat of free entry, and he shows that firms can deter entry by credibly threatening to meet any entrant with an episode of below-cost pricing.[14] In the free-entry equilibrium, when firms do not collude, the response of the incumbent firms to entry is the single-period Nash equilibrium.

However, when firms collude, one response of incumbent firms to entry is defined by the cartel breaking up. When firms attempt to support cooperation by threatening to break up the cartel in response to either internal or external defection, price cannot be kept significantly above the competitive level when the cost of entry is low. Since single-period Nash equilibrium profits are always positive, the threat of discontinuing collusion is not a sufficiently severe punishment so as to allow active firms to maintain a significant degree of cooperation when the threat of entry is strong.

The other response, when firms collude, is defined by the cartel surviving entry. Incumbent firms can either accommodate the entrant by achieving a collusive outcome or coordinate in punishing the entrant. The strategy of the incumbent firms may or may not entail driving the new entrant out of the industry. Figure 1 shows a simple extensive form game.

The intuition behind Harrington's influential result is that firms will go through the proposed punishment if and only if their discount factor is sufficiently high. But since deviation from the punishment entails trading off higher profits today for lower profits tomorrow (as a firm postpones returning to the cooperative outcome), a higher discount factor allows firms to credibly threaten a higher value for output or a lower punishment price and thus a lower punishment payoff. The severity of the punishment can then be made greater as the discount factor is raised. There is some minimum discount factor, such that it is credible to impose a punishment that yields each firm its mini-max payoff of zero (that is, the lowest payoff that can be held

[14] Harrington, *supra* note 3.

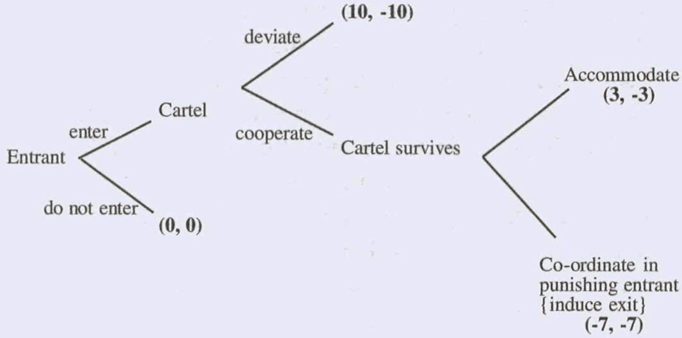

Figure 1. A simple extensive form game

down to by the other firms). Thus, the joint profit-maximizing price can be sustained under free entry and without there being a high cost to entry.

In sum, it is possible for any initial market structure to sustain a price above the competitive level, even the joint profit-maximizing price, regardless of the level of entry costs. Of course, in order for active firms to maintain a significant degree of cooperation, they must threaten entrants with a more severe punishment than simply breaking up the cartel. Dilip Abreu's pioneering derivation of optimal stick-and-carrot strategies characterizes the type of punishment that will indeed allow cooperation to be sustained under the threat of entry.[15]

Thus, if potential entrants expect the cartelists to respond aggressively to entry, the cartelists may be able to maintain price significantly above the competitive level despite low entry costs. However, a question arises as to when should the potential entrants expect cartelists to respond to entry with such aggressive behavior? Cartelists might instead plan to accommodate entrants or entry may induce the cartel to break up. The source of this problem is that there exist multiple sub-game perfect equilibria for the infinite horizon game and, therefore, different possible outcomes for the post-entry game.

Pioneer Foods, the allocated cartelist in Mossel Bay and Worcester areas, first approached entrants with a proposal to accommodate them if they agreed to fix their prices. Pioneer Foods then realized that it is a self-defeating and unprofitable policy for an incumbent firm to accommodate entry when there is a large pool of potential entrants. Pioneer Foods' behavior is summarized in the following allegations: (1) In Worcester, independent bakeries met with Pioneer Foods in 2002 in order to fix prices of bread. According to Ocean Bakery, Pioneer Foods wanted to have the price of bread fixed at 3.00 rand per loaf and threatened to engage in a price war if the other firms refused to do the same; (2) Wynland Bakery entered the

[15] Dilip Abreu, *Extremal Equilibria of Oligopolistic Supergames*, 39 J. ECON. THEORY 191 (1986).

Worcester market in 2002, and alleged that Pioneer Foods threatened that, should Wynland Bakery continue charging prices below those charged by Pioneer Foods, Pioneer Foods would drop their price. According to Wynland Bakery, Pioneer Foods reduced its price of the Vita bread to 2.00 rand per loaf when Wynland Bakery refused to comply with Pioneer Foods' demands; and (3) Mossel Bay Bakery alleged that when it entered the Mossel Bay market in 2004, Pioneer Foods threatened a price war and that Pioneer Foods repeated its threats in 2007.

A. Variables and Estimation

In this section we describe the data and variables used in the empirical analysis. We deal here with monthly time series data. Private data were obtained during the investigation. To complement the private data, we include in the dataset monthly consumer price index data gathered from Statistics South Africa. This data capture monthly food prices and are provided by the South African Grain Information Service. The data available correspond to the period from January 2003 to December 2009.

To determine whether a hypothetical competitor as efficient as Pioneer Foods would be likely to be foreclosed by Pioneer Foods' conduct requires examining Pioneer Foods' own monthly unit cost and prices. The *Price* variable is monthly unit "net sales realisation" price—that is, the price after all discounts and/or rebates have been taken into account per loaf of standard 600 gram bread.[16] While bread is perishable and has a limited shelf life, it can be transported over long distances. For example, Pioneer Foods has a bakery in Worcester and supplies bread from this bakery to its depots in Mossel Bay, Beaufort West and other areas. Figure 2 below shows the distribution network of Pioneer Foods from Worcester. We consider Pioneer Foods' prices in relation to standard bread in Worcester and Mossel Bay (about 300 kilometers away). In these towns, Pioneer Foods is the allocated cartelist in town and is super dominant.

The *average variable costs* variable includes input costs, activity costs and distribution costs. A firm's costs can be divided into those that vary with

[16] Bread is a homogenous product often made from wheat-flour dough that is cultured with yeast, allowed to rise, and finally baked in an oven. Owing to its high levels of gluten (which give the dough sponginess and elasticity), wheat is the most common grain used for the preparation of bread. There are many different variations of bread such as white bread, brown bread, whole wheat bread, rye bread, and so on. Sasko bakeries has 32 different kinds of bread products, for instance standard bread, English pan loaf, specialty loaves and sandwich loaves, and so on. Sasko manufactures different types of bread (white, brown, homemade and health breads) under the brand names such as Sasko Sam, Daybreaker, Uncle Salie and Nature's Harvest. Apart from bread, Sasko also produce rolls and buns. The different kinds of breads have significantly different product attributes such as more pronounced tastes, and denser, grainier textures, which can be used in the segmentation of bread.

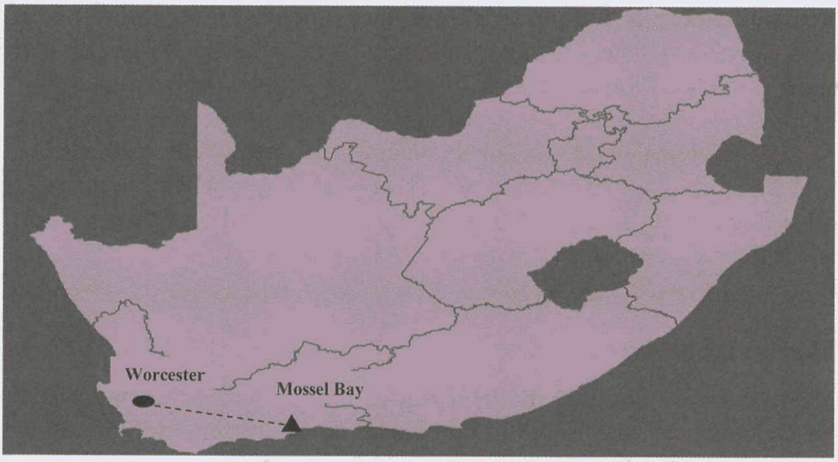

Figure 2. Pioneer Foods' distribution, Worcester to Mossel Bay

output and those that are fixed. Costs that do vary with output are the variable costs since they vary in proportion to output. Average variable costs are therefore equal to average total cost less average fixed costs.

Pioneer Foods is vertically integrated, active in the flour industry, upstream, and the bread industry, downstream. Due to transfer pricing, the price Pioneer Foods charges itself for flour may not be a true reflection of what it would cost Pioneer Foods to manufacture. Therefore, we use the price of flour that Pioneer Foods charges independent bakeries. The cost of flour used for one loaf white and brown bread flour is calculated from the price that Pioneer Foods charges to other independent bakeries for 12.5 kilograms of white and brown bread flour in the Western Cape region. Other input costs used in the production and packaging of a loaf of bread are also included. The inputs used in the production of Pioneer Foods' 600 gram bread loafs are very similar, with the only difference being the type of flour used in the production of the particular bread type. Activity costs per loaf of bread include the costs associated with production, electricity, oven fuel, direct depreciation on production equipment, and maintenance of production equipment per loaf of bread. Distribution costs include monthly distribution costs per loaf of bread. Distribution costs include labor, fuel, and vehicle maintenance costs.

Price war is a dummy variable capturing the period when there was predatory pricing—that is, prices below AVC. A typical price war lasts for at least three months. We include variables related to market demand, such as prices of substitutes, because shifts in demand may alter cost structures by changing the scale of firm operations, and oligopolists also have an incentive to increase their mark-up when demand becomes more inelastic. Both maize meal and bread are staple foods for many South Africans. The *maize meal* and *self-raising flour* variables correspond to the monthly consumer price index prices for a bag of maize meal (1 kilogram) and self-raising flour (500 grams). We include the *concentration variable* related to market structure because it reflects the extent to which the firms are able to exercise market power. We estimate the following regression equation:

$$P_t = \alpha + \beta X_t + \varphi D_t + \varepsilon_t,$$

where P_t is the price of bread, D_t is the dummy variable that indicates the period of prices below average variable costs, and X_t represents a vector of exogenous covariates, such as variables that affect per-unit costs (for example, input prices); variables affecting demand (for example, the prices of substitute products); and variables related to market structure (for example, seller concentration). The subscript t represents a time dimension. The error term is independent of, and uncorrelated with, all of the right-hand variables and reflects random conduct by market participants, and demand and cost shifters.

The null hypothesis is $\varphi = 0$—that is, the period of predatory pricing had no effect on price. A negative and statistically significant coefficient on the dummy variable supports a finding of predatory pricing. There are two challenges to estimating the regression model.[17] First, the omission of relevant variables can bias the results. For example, if costs were low during those periods of the alleged predatory pricing because of the influence of variables not included in the regression model, or if demand grew more inelastic during that period in ways not captured by the included demand-side variables, then a dummy variable reflecting the likely effect of predatory pricing might have a large negative coefficient for reasons unrelated to the existence of the alleged conduct. In general, omitted variables that are correlated with the dependent variable reduce the probative value of the regression analysis. Second, the results might not be robust to the choice of functional form. For example, a dummy variable indicating the likely effect of a predatory pricing might have a large negative coefficient, but the coefficient might be reduced when a log-linear model is estimated.

B. Empirical Results

Recall that the legal standard for predatory pricing involves examining the relationship between price and average variable costs and/or marginal cost. Figure 3 shows Pioneer Foods' price, and AVC and margins for Vita and Econo bread for the period from January 2003 to October 2009 in Worcester. Pioneer Foods priced below AVC in early 2003 as well as from

[17] *See also* Daniel L. Rubinfeld, *Quantitative Methods in Antitrust*, *in* 1 ISSUES IN COMPETITION LAW AND POLICY 723 (ABA Section of Antitrust Law 2008).

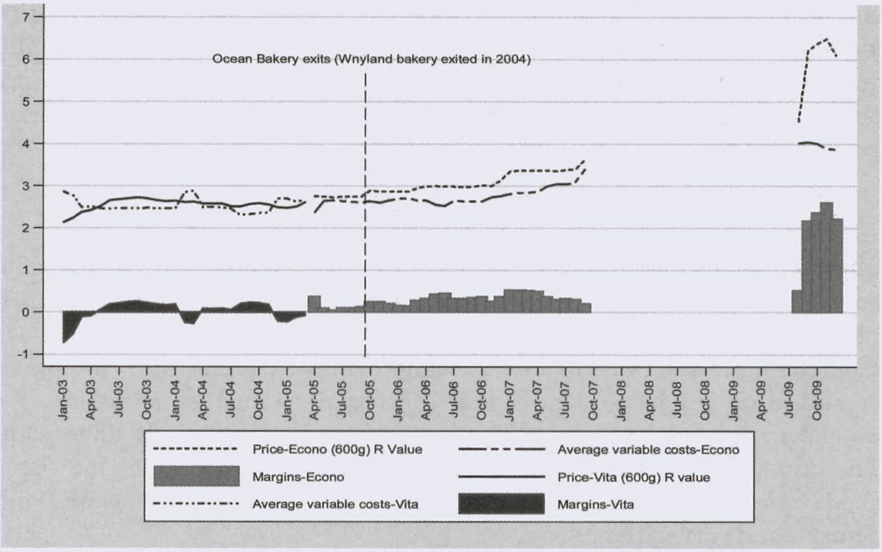

Figure 3. Sasko's Vita and Econo bread prices and average variable costs, (600 grams) in Worcester

February 2004 until about July 2004. Vita bread was renamed Econo bread in April 2005. Ocean Bakery exited the market toward the end of 2005. Qualibake and Wynland Bakeries were closed down in 2004. Pioneer Foods' margins increased from around February 2006, after its competitors exited the market. Econo bread was removed from the Worcester market in September 2007. In August 2009, Econo was re-introduced in Worcester but this time at a much higher price. Essential Vita and Econo bread brands were used as fighting brands. Vita and Econo brands were closet substitutes to the bread baked by independents and were targeted at Living Standards Measure (LSM)[18] category 1 to 4, while it could be argued that Sasko Sam is high-quality bread and targets LSM categories 1 to 7. Fighting brands confine predatory pricing to particular brands so that the dominant firm avoids losing money on all of its sales. By engaging in such a strategy, the dominant firm may seek to limit the cost of its predatory strategy.

Figures 4 and 5 show Sasko Sam white and brown bread prices and AVC in Mossel Bay for the period from January 2003 to October 2009.

Up until November 2004, Pioneer Foods had baked and sold bread in Mossel Bay. Pioneer Foods closed down its bakery in Mossel Bay in October 2004, and opened a distribution depot and transported bread to Mossel Bay baked at Pioneer Foods' Worcester bakery about 300 kilometers

[18] Living Standards Measure is a common metric in South Africa for assessing standard of living. It divides the population into 10LSM groups, 10 being the highest and 1 the lowest.

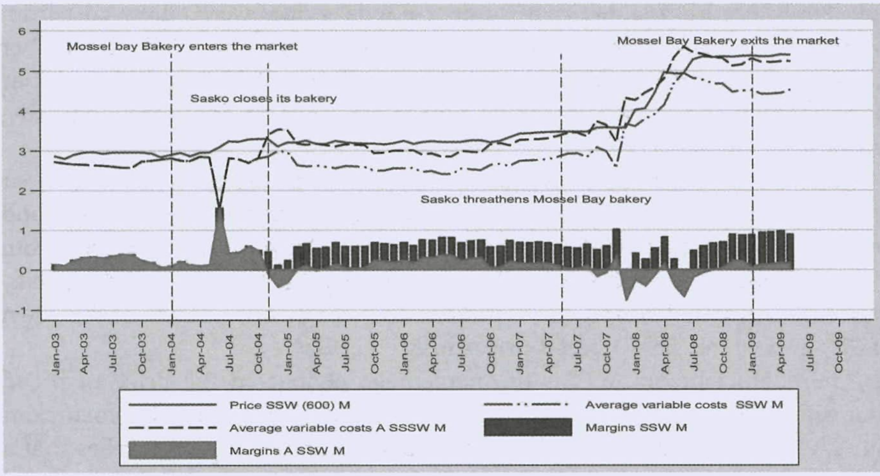

Figure 4. Sasko Sam white bread prices and average variable costs, (600 grams) in Mossel Bay

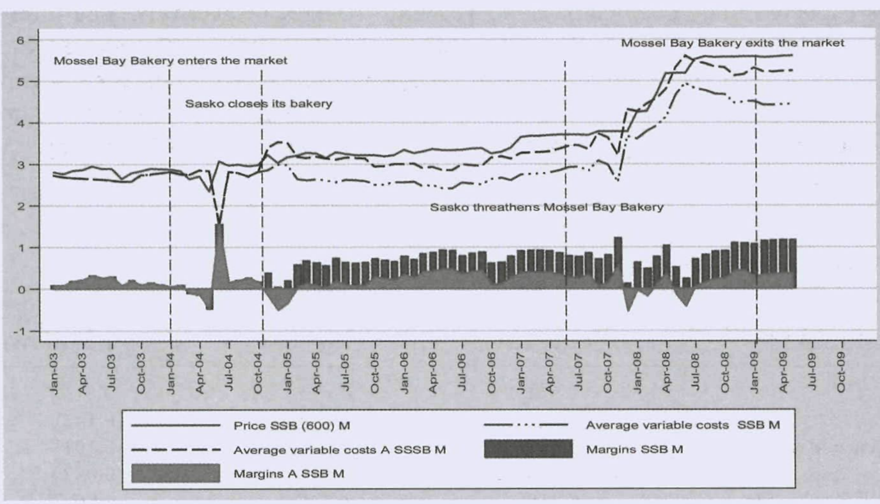

Figure 5. Sasko Sam brown bread prices and average variable costs, (600 grams) in Mossel Bay

away. Average variable cost represents transport costs from Worcester to Mossel Bay and local distribution costs. These transport costs are based on estimates from an independent bakery. The shaded margins represent Pioneer Foods' margins, inclusive of the transport costs from Worcester to Mossel Bay, and bars represent Pioneer Foods' margin, assuming it baked bread in Mossel Bay. Figure 4 shows that Pioneer Foods's prices were below AVC from October 2004 to March 2005 and again from September 2007 to

July 2008. Figure 5 shows that Pioneer Foods' prices were below cost from March 2004 to May 2004, November 2004 to January 2005, December 2007 to February 2008, and April 2008 to May 2008. The Mossel Bay bakery exited the market in January 2009 and became Pioneer Foods' distributor in Mossel Bay.

Table 1 below summarizes the estimated parameters from the log-linear specification using OLS. The model exhibits good statistical significance and overall fit. The first specification in column (1) represents results from Pioneer Foods' Vita and Econo (EV) bread prices in Worcester. The specification in column (2) and (3) represent Pioneer Foods' Sasko Sam brown (SSB) and white (SSW) bread prices in Mossel Bay.

The coefficient on AVC is the percentage change in the price of bread that follows from a percentage change in AVC. For example, the coefficient on AVC is approximately 0.32 as shown in column (3), which implies that a one percent increase in AVC will raise the price of Sasko Sam white bread by about 0.32 percent in Mossel Bay. This is to be expected because an increase in variable costs is passed on to consumers. In columns (1) and (2), the coefficient on the dummy variable, price war, is negative and significant, as expected. The coefficient is -0.177 and -0.075, respectively. The interpretation of these results is that pricing below variable costs reduced the price of a loaf of Vita/Econo bread by approximately 16.2 percent ($= \exp(-0.177) - 1$) in Worcester, and the price of a loaf of Sasko Sam white bread by approximately 7.2 percent ($= \exp(-0.075) - 1$) in Mossel Bay.

Table 1. Results from the regression analysis

VARIABLES	(1) Price (EV)	(2) Price (SSB)	(3) Price (SSW)
AVC	0.961***	0.155	0.316**
	(0.0913)	(0.100)	(0.142)
Maize Meal	−0.171*	−0.107	−0.191***
	(0.0854)	(0.101)	(0.0574)
Self Raising Flour	0.419*	1.121***	0.862***
	(0.220)	(0.147)	(0.189)
Seller concentration	4.75e−05		
	(2.91e−05)		
Price war1	−0.177***		
	(0.0253)		
Price war2		−0.0753*	
		(0.0386)	
Price war3			−0.0308
			(0.0217)
Observations	57	72	72
R-squared	0.814	0.825	0.838

Robust standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

V. CONCLUSION

The story behind predatory pricing by a cartel is that a new entrant decides to enter and gain market share by undercutting the cartel pricing equilibrium. Either all firms together or a few alone respond by engaging in a price war until the new entrant relents and is either accommodated into the cartel or exits. Generally, in oligopoly industries, raising prices after a predatory price war does not only require discouraging entry, but also requires discouraging competition from many competitors.

The question then becomes, is a cartel price war following new entry predatory? Or does that depend on whether its motivation is to encourage higher prices? To illustrate this observability problem, suppose entry is observed in the bread industry for which it is believed that entry barriers are relatively low. This is followed by a period in which prices below AVC are observed. However despite the aggressive welcome, the new firm does not exit. This leads to a period in which bread prices increase and thereafter stabilize. At first glance, one may conclude that the period of price below AVC signaled the intent to promote exit, which turned out to be unsuccessful. This analysis would therefore increase the probability of type II errors by allowing anticompetitive predatory pricing.

In contrast, another interpretation may be that for the bread cartel to effectively maintain cooperation under the threat of entry, given the low barriers in bread baking, it had to respond to entry by pricing below AVC. Below AVC pricing in response to entry that succeeds in inducing exit therefore is indicative of successful predation. However, below AVC pricing in response to entry that fails to induce exit may not be indicative of unsuccessful exit promotion but rather of successful collusion. By responding aggressively to entry, the cartel members are acting to deter future entry and by doing so are able to sustain a significant degree of cooperation in spite of the absence of substantial barriers.

The evidence on the price wars in several towns in the Western Cape province suggests that they were predatory in nature. Comparing AVC to prices to establish whether the conduct was anticompetitive suggests indeed that a legal standard was violated. In both Worcester and Mossel Bay, entrants were driven out of the market by predatory prices and after their exit prices increased substantially. This provides one essential element of a predation case, proving that losses can be recouped. Establishing predatory intent is an important part of the qualitative argument. Entrants quote a series of threats to use of predatory pricing. These threats were part of a deliberate and conscious attempt to force new entrants out of the market. There were also meetings on the formal terms under which an entrant could be admitted to the cartel. If entrants did not abide to the terms, a price war would be declared. Pioneer Foods admitted to the strong evidence of predatory intent on the part of its managers. The timing of entry into the cartel, price wars, and the price movements described are all consistent with the predation story.

Access to markets is actively limited by the cartels, using strategic behavior such as predatory price wars. Cartels need to exclude entrants simply because firms who face numerous rivals are constrained in their incentive and ability to coordinate. Cartel investigations do not usually discuss whether the cartel engaged in activities to block entry because such evidence is not necessary for conviction, especially so where price fixing is *per se* illegal. But undermining barriers, especially those erected by cartelists, is an important part of competition policy.

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