

The Arcor/Bagley Merger and the Argentine Biscuit Market: Price Increases vs. Cost Reductions

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This paper analyzes the behavior of the Argentine biscuit market during 2003-06 to find out whether any important merger occurred in October 2004 (the Arcor/Bagley merger) had any discernible market power or cost reduction effects. This paper presents an econometric demand-and-supply model in which it treats the biscuits supplied by the main producers as different products. The results show that there is an appreciable cost reduction that more than counterbalances the price increases induced by the merger. This implies that total consumers' surplus grew as a consequence of the merger.

Introduction

In October 2004, the Argentine Commission for the Defense of Competition (CNDC) recommended the approval of a transaction of the merger of the two of the most important biscuit producers of Argentina, namely Arcor and Bagley¹. A few days later, the Secretary of Technical Coordination of Argentina (who was the Officer-in-Charge of approving mergers) accepted the opinion of the CNDC, and the transaction was officially approved. At the beginning of the year 2005, Arcor and Bagley began to operate as a single entity, producing and marketing all their products together.

Before the merger, Bagley was a division of the French firm Danone, which operates in several food product markets in Argentina. On the other hand, Arcor is an Argentine firm that produces biscuits and different kinds of tidbits in Argentina and other South American countries. After the merger, all the Arcor's and Bagley's assets devoted to the biscuit business in Argentina were transferred to a newly created company, jointly owned by Arcor and Danone, but solely managed by Arcor.

Recommending the approval of the proposed merger, the CNDC mentioned that Arcor and Bagley faced an important degree of competition from a third biscuit producer (Kraft Foods), whose likely reaction, in case the newly merged entity decided to increase its prices, would be to capture a relatively large fraction of Arcor's and Bagley's demand. The CNDC also considered unlikely that Arcor/Bagley and Kraft entered into a price-fixing agreement as a consequence of the merger. The main cause for this is the existence of a relatively important product

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¹ CNDC: Opinion No. 403, October 1, 2004 (summary in Spanish available at "www.mecon.gov.ar/cndc").

differentiation among the different biscuit products, which makes price-fixing agreements not easy to execute or monitor.

Another element that could have been considered by the CNDC in its analysis of the Arcor/Bagley case is the possibility that, as a consequence of the merger, the cost of producing and marketing biscuits could be reduced, and that reduction could partially pass on to the consumers through lower prices. In the hypothetical scenario in which this reduction was significant, the post-merger prices of Arcor and Bagley products could be lower rather than higher, and that could imply that the newly merged entity increased its market share.

Of course, when the CNDC had to evaluate the likely effects of the Arcor/Bagley merger on the Argentine biscuit market, it could only use pre-merger price and quantity information. After two years of joint operation of the newly merged entity, however, we are now able to evaluate some of the actual effects of the merger. That is what we will try to do in this paper, using some price and quantity data from January 2003 to March 2006. That period includes the last two years of operation of Arcor and Bagley as separate firms (2003-04) and their first 15 months as a single entity (2005-06).

In this paper, we will consider two main contrasting hypotheses that may serve to explain the changes in the Argentine biscuit market that occurred in the last two years. The first hypothesis is the idea that those changes are basically due to an increase in the degree of market power that Arcor and Bagley obtained as a consequence of their merger. The second hypothesis is the idea that they can be basically explained by the effect of a cost reduction in the provision of the Arcor/Bagley biscuits, that had an impact on the prices actually set by the different firms. Of course, both phenomena could have occurred at the same time, so in order to disentangle their relative importance, we will estimate a model in which we will separate demand forces (on which the firms could have operated to increase their degree of market power) from supply forces (on which possible cost reductions could have appeared).

The Argentine Biscuit Market

Argentina is a country with a relatively large per capita biscuit consumption. According to the data that we have obtained, the total consumption of biscuits in Argentina averaged almost 24,000 metric tons per month in 2003-06, which implies nearly 8 kilograms per capita annually².

Several hundreds of products can be found in the Argentine biscuit market. They are basically differentiated by brands and by their special characteristics (sweetened or unsweetened, salty or not salty, filled or not filled, covered with chocolate or not, etc). They also come in packages of different sizes, and are sold in different outlets (supermarkets, traditional grocery stores, and convenience stores).

According to the uses of the biscuit industry, however, the three main groups into which biscuits can be classified are: the group of unsweetened biscuits (or crackers); the group of plain sweet biscuits (that is, sweet biscuits that are

² All the data concerning the Argentine biscuit market that we use in this study comes from a proprietary data set elaborated by the consulting firm A. C. Nielsen. We thank Juan Pablo Alvarado (Kraft Foods) for having given us access to that information.

not filled with any particular stuffing); and the group of sandwich cookies (i.e. is, sweet biscuits that are filled with milk caramel sauce, cream, chocolate or another similar stuffing). This classification is also the one used by the CNDC when it analyzed the likely effects of the Arcor/Bagley merger.

After many years of evolution, that included several mergers and acquisitions of small companies by other larger producers, the Argentine biscuit market at the end of 2004 was supplied by three major firms (Arcor, Bagley, and Kraft), which accounted for nearly 75% of total sales revenue, and by a group of at least 21 minor firms, which supplied the remaining 25%. None of these minor firms had a market share larger than 4%, and none of them changed its individual market share very much in 2005-06.

The relative market share of the three major firms and the 21 minor firms is considerably different in the different segments in which we can divide the Argentine biscuit market. From Table 1, we can see that Bagley and Kraft have been the largest firms in the cracker segment (with a market share of nearly 29%

Concept	Arcor	Bagley	Kraft	Others	Total
Average Prices (ARS\$/kg)					
All Biscuits	6.2651	7.1273	6.7583	5.6228	6.3893
Pre-merger	6.0472	7.0330	6.5637	5.5527	6.2700
Post-merger	6.5427	7.2607	7.0551	5.7074	6.5492
Crackers	6.1913	6.0503	6.1409	5.6540	6.0068
Plain Sweet	5.9516	5.8313	6.5773	5.4046	5.8431
Sandwich	8.2669	11.2549	11.1224	8.8111	10.3609
Supermarkets	4.9673	5.8772	6.0586	6.1945	5.7522
Grocery Stores	6.1860	7.0489	6.5440	5.4243	6.1578
Convenience Stores	8.0430	9.2687	8.2935	5.8461	7.5910
Quantities (kg/month)					
All Biscuits	5,190,042	5,513,693	5,746,968	7,233,759	23,684,461
Pre-merger	4,724,372	5,250,272	5,641,070	6,426,520	22,042,234
Post-merger	5,935,113	5,935,167	5,916,404	8,525,340	26,312,024
Crackers	2,021,881	3,025,107	2,980,792	2,562,985	10,590,763
Plain Sweet	2,674,630	1,293,264	2,251,141	4,394,975	10,614,010
Sandwich	493,532	1,195,322	515,035	275,799	2,479,688
Supermarkets	1,516,420	1,825,032	1,975,993	805,896	6,123,342
Grocery Stores	2,457,330	2,530,673	2,518,825	4,495,246	12,002,073
Convenience Stores	1,216,292	1,157,988	1,252,149	1,932,617	5,559,046
Market Shares (%)					
All Biscuits	21.49	25.97	25.67	26.88	100.00
Pre-merger	20.67	26.72	26.79	25.82	100.00
Post-merger	22.53	25.01	24.22	28.24	100.00
Crackers	19.68	28.77	28.77	22.78	100.00
Plain Sweet	25.67	12.16	23.87	38.30	100.00
Sandwich	15.88	52.36	22.30	9.46	100.00
Supermarkets	21.39	30.45	33.99	14.17	100.00
Grocery Stores	20.57	24.14	22.30	32.99	100.00
Convenience Stores	23.18	25.43	24.61	26.77	100.00
<i>Source: Own calculations based on Data from A C Nielsen.</i>					

each), while Arcor is more important in the plain sweet biscuit segment, and Bagley is clearly larger in the segment of sandwich cookies (with a market share of more than 52%). Taken as a whole, the minor firms are very important in the plain sweet biscuit segment (with a market share of 38.3%), but are much more irrelevant in the sandwich cookie business.

Table 1 also shows the existence of different marketing strategies concerning the sale of the biscuits. While in the supermarket channel the three major firms have a market share of more than 85% of total revenue sales (led by Kraft, with a share of nearly 34%), in grocery stores they only capture 67% of those sales (and the firm that sales more is Bagley, with a share of 24%), and in convenience stores their joint share is 73%.

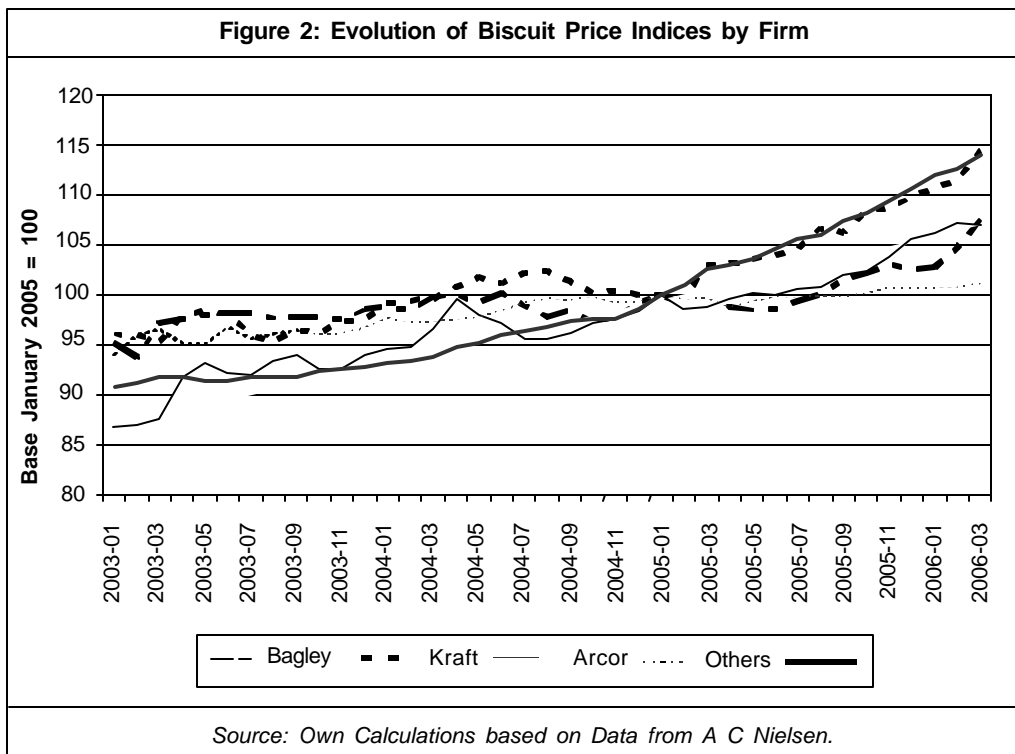
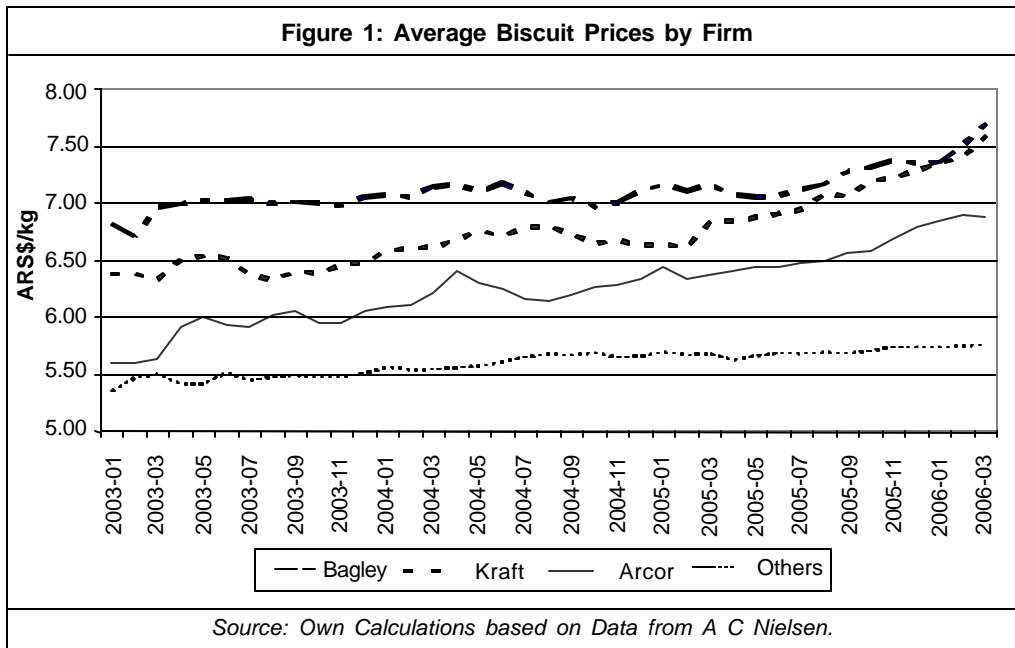
The different types of biscuits and marketing channels also generate different prices for the biscuits. While the average price for crackers and plain sweet biscuits sold to final consumers oscillated around 6 Argentine pesos per kilogram during 2003-06, the average price of sandwich cookies exceeded 10 ARS\$/kg (and was clearly larger for Bagley and Kraft than for Arcor and for the minor firms)³. Prices per kilogram are also higher when biscuits are sold in convenience stores (where packages are generally smaller), and lower when they are sold in the supermarkets. Traditional grocery stores, however, are still the outlets that concentrate the largest fraction of the biscuit sales, since they participate with more than 48% of the total revenue and more than 50% of the total volume.

If we compare the pre-merger and post-merger figures, some interesting phenomena appear. In general, we find that the average biscuit price increased by 4.45%, and this is a number that is considerably smaller than the Argentine inflation in the same period⁴. The largest increase, however, appears in the average price of Kraft's biscuits (7.47%), while the smallest increase corresponds to the group of minor firms (2.79%). Figure 1 depicts the behavior of all those average prices during the whole period. In it we can see that although the price ranking did not change (since Bagley biscuits were always the most expensive on average, followed by Kraft, Arcor and the others, in that order), the gap between Bagley's and Kraft's prices clearly shortened, while the gap between the prices of Arcor and the minor firms increased.

In Figure 2, we have translated the biscuit price series into price index series, and compared them with the evolution of the Argentine Consumer Price Index (CPI). If we look at it, we can see that, during the first six months after their merger, Arcor and Bagley tended to keep their average prices relatively constant, and after that those prices began to increase, following approximately the inflation rate. Kraft's average prices, conversely, increased at the same rate than the CPI during the whole post-merger period, while the average price of the minor firms increased very little during 2005-06.

³ These are roughly equivalent to US\$2 and 3.33 per kilogram, respectively, since the market exchange rate was around 3 Argentine pesos per US dollar during the whole period under analysis.

⁴ If we compare the evolution of the Argentine Consumer Price Index, for example, we find that the average CPI in the period January 2005-March 2006 was 13.65% higher than in the period 2003-04.



An Econometric Model of Biscuit Demand and Supply

The differences in the prices and the quantities traded before and after the Arcor/Bagley merger might be explained by several factors. Some of them could be

related to changes in demand due to increase in consumers' income or to variations in their tastes. Some others could be related to changes in the cost of the inputs needed to produce and to market biscuits. Finally, a third group of factors could be imputed to the merger itself, through market power or cost reduction phenomena. We decided to develop a model aimed at sorting out those possible interrelated factors⁵.

The available alternatives to model the demand for biscuits depended on the definition of the products that we wanted to consider. As we were mainly interested in using demand to analyze the exercise of market power by the major biscuit firms, we decided to define the products according to the firm that supplies them. We, therefore, worked as if the Argentine biscuit market were constituted by four goods, which are the biscuits supplied by Arcor, Bagley, Kraft, and the other (minor) firms. The demand for each of those products depended on the prices of the four goods and on consumers' nominal income.

One of the most widely used alternatives to model demand in cases like this is the logarithmic demand specification, that consists of estimating relationships between the logarithms of the products' traded quantities and the logarithms of the independent variables (i.e., prices and income). This specification has the advantage that it directly estimates the elasticities of demand with respect to the independent variables, which are useful to calculate the degree of market power that the supplying firms may possess⁶.

The logarithmic specification has the disadvantage that, when applied to a system of interrelated demand equations, it is not able to capture the relationships among those demands that economic theory predicts. In order to take care of those relationships, and also to improve the precision in the estimation of the relevant coefficients, it is necessary to include some restrictions. One of them is the homogeneity restriction, which states that, for each demand equation, the sum of the own-price elasticity, the cross-price elasticities and the income elasticity must add up to zero. Another one is the symmetry restriction, which states that the ratio between the Hicksian cross elasticity of the i^{th} good with respect to the price of the j^{th} good and the Hicksian cross elasticity of the j^{th} good with respect to the price of the i^{th} good must equal the ratio between the consumer's expenditure share in the j^{th} good and the consumer's expenditure share in the i^{th} good⁷.

One way to include those restrictions in the estimation of a demand system, which we explored in a previous paper (Coloma, 2006), is to use the concept of elasticity of substitution, which is a symmetric measure of the degree of consumers' substitution between two goods. Applying certain theoretical relationships between the elasticities of substitution and the Hicksian cross-price elasticities, and between these and the Marshallian (or ordinary) cross-price

⁵ As we will see, the model to be developed is in the tradition of the so-called "new empirical industrial organization". For a general review of the literature embedded in that tradition, see Martin (2002), chapter 7.

⁶ Other possible alternatives to model demand in cases like this are the so-called "flexible functional forms". These are, for example, the translog demand system, originally proposed by Christensen, Jorgenson and Lau (1975), the Almost Ideal Demand System (AIDS), created by Deaton and Muellbauer (1980), and the Quadratic Almost Ideal Demand System (QUAIDS), developed by Banks, Blundell and Lewbel (1997).

⁷ For a theoretical explanation of these restrictions and its implications for empirical analysis, see Barten (1993).

elasticities and the income elasticities, it is possible to write the logarithmic demands of the different products as functions whose coefficients are the own-price Marshallian elasticities and the elasticities of substitution. For our case of four goods whose demands depend on four prices and income, this procedure is able to reduce the number of elasticity coefficients to estimate from 20 to 10, while incorporating at the same time the homogeneity and symmetry restrictions predicted by economic theory.

Beginning from this initial logarithmic specification for the demand of Arcor's, Bagley's, Kraft's, and Others' biscuits:

$$\ln(Q_B) = \alpha_B + \eta_{BA} \cdot \ln(P_A) + \eta_{BB} \cdot \ln(P_B) + \eta_{BK} \cdot \ln(P_K) + \eta_{BO} \cdot \ln(P_O) + \eta_{BY} \cdot \ln(Y) \quad \dots(1)$$

$$\ln(Q_B) = \alpha_B + \eta_{BA} \cdot \ln(P_A) + \eta_{BB} \cdot \ln(P_B) + \eta_{BK} \cdot \ln(P_K) + \eta_{BO} \cdot \ln(P_O) + \eta_{BY} \cdot \ln(Y) \quad \dots(2)$$

$$\ln(Q_K) = \alpha_K + \eta_{KA} \cdot \ln(P_A) + \eta_{KB} \cdot \ln(P_B) + \eta_{KK} \cdot \ln(P_K) + \eta_{KO} \cdot \ln(P_O) + \eta_{KY} \cdot \ln(Y) \quad \dots(3)$$

$$\ln(Q_O) = \alpha_O + \eta_{OA} \cdot \ln(P_A) + \eta_{OB} \cdot \ln(P_B) + \eta_{OK} \cdot \ln(P_K) + \eta_{OO} \cdot \ln(P_O) + \eta_{OY} \cdot \ln(Y) \quad \dots(4)$$

where Q_A , Q_B , Q_K and Q_O are the corresponding quantities; P_A , P_B , P_K and P_O are the average product prices; and Y is the consumers' nominal income; we can reach the following final specification:

$$\begin{aligned} \ln(Q_A) = & \mathbf{a}_A + \mathbf{h}_{AA} \cdot \left[\ln(P_A) - \frac{\ln(Y)}{s_A} + \frac{s_B \cdot \ln(P_B)}{s_A} + \frac{s_K \cdot \ln(P_K)}{s_A} + \frac{s_O \cdot \ln(P_O)}{s_A} \right] \\ & + \mathbf{s}_{AB} \cdot s_B \cdot \left[\ln(P_B) - \frac{\ln(Y)}{s_A} + \frac{s_B \cdot \ln(P_B)}{s_A} + \frac{s_K \cdot \ln(P_K)}{s_A} + \frac{s_O \cdot \ln(P_O)}{s_A} \right] \\ & + \mathbf{s}_{AK} \cdot s_K \cdot \left[\ln(P_K) - \frac{\ln(Y)}{s_A} + \frac{s_B \cdot \ln(P_B)}{s_A} + \frac{s_K \cdot \ln(P_K)}{s_A} + \frac{s_O \cdot \ln(P_O)}{s_A} \right] \\ & + \mathbf{s}_{AO} \cdot s_O \cdot \left[\ln(P_O) - \frac{\ln(Y)}{s_A} + \frac{s_B \cdot \ln(P_B)}{s_A} + \frac{s_K \cdot \ln(P_K)}{s_A} + \frac{s_O \cdot \ln(P_O)}{s_A} \right] \quad \dots(5) \end{aligned}$$

$$\begin{aligned} \ln(Q_B) = & \mathbf{a}_B + \mathbf{s}_{AB} \cdot s_A \cdot \left[\ln(P_A) - \frac{\ln(Y)}{s_B} + \frac{s_A \cdot \ln(P_A)}{s_B} + \frac{s_K \cdot \ln(P_K)}{s_B} + \frac{s_O \cdot \ln(P_O)}{s_B} \right] \\ & + \mathbf{h}_{BB} \cdot \left[\ln(P_B) - \frac{\ln(Y)}{s_B} + \frac{s_A \cdot \ln(P_A)}{s_B} + \frac{s_K \cdot \ln(P_K)}{s_B} + \frac{s_O \cdot \ln(P_O)}{s_B} \right] \\ & + \mathbf{s}_{BK} \cdot s_K \cdot \left[\ln(P_K) - \frac{\ln(Y)}{s_B} + \frac{s_A \cdot \ln(P_A)}{s_B} + \frac{s_K \cdot \ln(P_K)}{s_B} + \frac{s_O \cdot \ln(P_O)}{s_B} \right] \\ & + \mathbf{s}_{BO} \cdot s_O \cdot \left[\ln(P_O) - \frac{\ln(Y)}{s_B} + \frac{s_A \cdot \ln(P_A)}{s_B} + \frac{s_K \cdot \ln(P_K)}{s_B} + \frac{s_O \cdot \ln(P_O)}{s_B} \right] \quad \dots(6) \end{aligned}$$

$$\begin{aligned} \ln(Q_K) = & \mathbf{a}_K + \mathbf{s}_{AK} \cdot s_A \cdot \left[\ln(P_A) - \frac{\ln(Y)}{s_K} + \frac{s_A \cdot \ln(P_A)}{s_K} + \frac{s_B \cdot \ln(P_B)}{s_K} + \frac{s_O \cdot \ln(P_O)}{s_K} \right] \\ & + \mathbf{s}_{BK} \cdot s_B \cdot \left[\ln(P_B) - \frac{\ln(Y)}{s_K} + \frac{s_A \cdot \ln(P_A)}{s_K} + \frac{s_B \cdot \ln(P_B)}{s_K} + \frac{s_O \cdot \ln(P_O)}{s_K} \right] \end{aligned}$$

$$\begin{aligned}
& + h_{KK} \cdot \left[\ln(P_K) - \frac{\ln(Y)}{S_K} + \frac{s_A \cdot \ln(P_A)}{S_K} + \frac{s_B \cdot \ln(P_B)}{S_K} + \frac{s_O \cdot \ln(P_O)}{S_K} \right] \\
& + s_{KO} \cdot s_O \cdot \left[\ln(P_O) - \frac{\ln(Y)}{S_K} + \frac{s_A \cdot \ln(P_A)}{S_K} + \frac{s_B \cdot \ln(P_B)}{S_K} + \frac{s_O \cdot \ln(P_O)}{S_K} \right] \quad \dots(7)
\end{aligned}$$

$$\begin{aligned}
\ln(Q_O) = & a_O + s_{AO} \cdot s_A \cdot \left[\ln(P_A) - \frac{\ln(Y)}{S_O} + \frac{s_A \cdot \ln(P_A)}{S_O} + \frac{s_B \cdot \ln(P_B)}{S_O} + \frac{s_K \cdot \ln(P_K)}{S_O} \right] \\
& + s_{BO} \cdot s_B \cdot \left[\ln(P_B) - \frac{\ln(Y)}{S_O} + \frac{s_A \cdot \ln(P_A)}{S_O} + \frac{s_B \cdot \ln(P_B)}{S_O} + \frac{s_K \cdot \ln(P_K)}{S_O} \right] \\
& + s_{KO} \cdot s_K \cdot \left[\ln(P_K) - \frac{\ln(Y)}{S_O} + \frac{s_A \cdot \ln(P_A)}{S_O} + \frac{s_B \cdot \ln(P_B)}{S_O} + \frac{s_K \cdot \ln(P_K)}{S_O} \right] \\
& + \eta_{OO} \cdot \left[\ln(P_O) - \frac{\ln(Y)}{S_O} + \frac{s_A \cdot \ln(P_A)}{S_O} + \frac{s_B \cdot \ln(P_B)}{S_O} + \frac{s_K \cdot \ln(P_K)}{S_O} \right] \quad \dots(8)
\end{aligned}$$

where $S_{A'}$, $S_{B'}$, $S_{K'}$ and S_O are the expenditure (or revenue) shares of the four products under analysis.

Note that, while in the standard logarithmic demand specification the coefficients to estimate are the own-price Marshallian elasticities (h_{AA} , h_{BB} , h_{KK} , and h_{OO}), the cross-price Marshallian elasticities (h_{AB} , h_{AK} , h_{AO} , h_{BA} , h_{BK} , h_{BO} , h_{KA} , h_{KB} , h_{KO} , h_{OA} , h_{OB} , and h_{OK}) and the income elasticities (h_{AY} , h_{BY} , h_{KY} , and h_{OY}), in the modified model the estimated coefficients are the own-price Marshallian elasticities and the elasticities of substitution between goods (s_{AB} , s_{AK} , s_{AO} , s_{BK} , s_{BO} and s_{KO}). In order to do this, the variables included in the regressions have to be modified, and they become functions of the prices, the nominal income and the revenue market shares of the different goods.

The estimated own-price Marshallian elasticities are useful to measure the degree of market power that each of the major biscuit producers possesses. Assuming that each of those producers prices its goods trying to maximize its profits, its relative margin between price and marginal cost should be equal to the inverse of the absolute value of its own-price Marshallian elasticity. However, due to the fact that our estimation uses monthly data from a relative short period of time, what we are able to estimate when running the regressions are the short run demand elasticities for each of the firms. To find the corresponding long run elasticities, we have to approximate a measure of the serial correlation coefficient for the estimated demands (ρ), and use it to calculate the following parameters:

$$\varepsilon_{AA} = \frac{\eta_{AA}}{1-\rho}; \quad \varepsilon_{BB} = \frac{\eta_{BB}}{1-\rho}; \quad \varepsilon_{KK} = \frac{\eta_{KK}}{1-\rho}; \quad \varepsilon_{OO} = \frac{\eta_{OO}}{1-\rho} \quad \dots(9)$$

where e_{AA} , e_{BB} , e_{KK} and e_{OO} are the long run own-price Marshallian elasticities for the biscuits supplied by Arcor, Bagley, Kraft and the other producers, respectively.

The corresponding profit-maximizing price/cost margins for Arcor, Bagley and Kraft are therefore the following⁸:

$$\frac{P_A - MC_A}{P_A} = \frac{1 - r}{-h_{AA}}; \quad \frac{P_B - MC_B}{P_B} = \frac{1 - r}{-h_{BB}}; \quad \frac{P_K - MC_K}{P_K} = \frac{1 - r}{-h_{KK}} \quad \dots(10)$$

and these relationships between prices, marginal costs, elasticities and serial correlation coefficients can also be written as:

$$P_A = MC_A \cdot \left(\frac{h_{AA}}{1 + h_{AA} - r} \right); \quad P_B = MC_B \cdot \left(\frac{h_{BB}}{1 + h_{BB} - r} \right)$$

$$P_K = MC_K \cdot \left(\frac{h_{KK}}{1 + h_{KK} - r} \right) \quad \dots(11)$$

The expressions that appear on equations 10 and 11, however, are valid as long as Arcor, Bagley and Kraft are independent firms that maximize their profits individually. After the Arcor/Bagley merger, however, the Arcor and Bagley became a single entity whose profit-maximizing price/cost margins could be approximated by the following expressions:

$$\frac{P_A - MC_A}{P_A} = \frac{1 - r}{-h_{MM}}; \quad \frac{P_B - MC_B}{P_B} = \frac{1 - r}{-h_{MM}} \quad \dots(12)$$

where h_{MM} is the own-price short run Marshallian elasticity of the composite commodity formed by the aggregation of Arcor's and Bagley's biscuits. In order to calculate that elasticity, it is necessary to estimate a demand for that composite commodity. Following the methodology used to estimate the other demands, we can write that:

$$\ln(Q_A + Q_B) = a_M + h_{MM} \cdot \left[\ln(P_M) - \frac{\ln(Y)}{s_A + s_B} + \frac{s_K \cdot \ln(P_K)}{s_A + s_B} + \frac{s_O \cdot \ln(P_O)}{s_A + s_B} \right]$$

$$+ s_{MK} \cdot s_K \cdot \left[\ln(P_K) - \frac{\ln(Y)}{s_A + s_B} + \frac{s_K \cdot \ln(P_K)}{s_A + s_B} + \frac{s_O \cdot \ln(P_O)}{s_A + s_B} \right]$$

$$+ s_{MO} \cdot s_O \cdot \left[\ln(P_O) - \frac{\ln(Y)}{s_A + s_B} + \frac{s_K \cdot \ln(P_K)}{s_A + s_B} + \frac{s_O \cdot \ln(P_O)}{s_A + s_B} \right] \quad \dots(13)$$

where P_M is the average price of Arcor's and Bagley's biscuits (which is equal to " $(P_A \cdot Q_A + P_B \cdot Q_B) / (Q_A + Q_B)$ ").

The expressions for P_A and P_B that appear on Equation 11, therefore, have to be re-written in the following way:

$$P_A = MC_A \cdot \left(\frac{h_{AA} \cdot (1 - M)}{1 + h_{AA} - r} + \frac{h_{MM} \cdot M}{1 + h_{MM} - r} \right);$$

⁸ Note that this reasoning cannot be applied to the profit-maximizing price/cost margins of the other (minor) producers. Since those producers are a heterogeneous group of small firms whose individual demands are not specified in our model, we will not analyze their behavior as suppliers.

$$P_B = MC_B \cdot \left(\frac{h_{BB} \cdot (1 - M)}{1 + h_{BB} - r} + \frac{h_{MM} \cdot M}{1 + h_{MM} - r} \right) \quad \dots(14)$$

where M is a dummy variable whose value is equal to zero in the pre-merger period (2003-04) and equal to one in the post-merger period (2005-06).

In order to estimate the coefficients of the proposed model, it is necessary to run a system of regressions formed by the demand Equations 5, 6, 7, 8 and 13, and by the supply prices implied by Equations 11 and 14. Those supply prices have to be regressed against some variables that help to explain the behavior of the firms' marginal costs, which could be, for example, the price of flour (P_F) and the registered private sector wage index (W)⁹. Assuming a linear relationship between those variables and the marginal costs, the corresponding supply price equations for Arcor, Bagley and Kraft can be written in the following way:

$$P_A = (b_A + b_F \cdot P_F + b_W \cdot W + g_A \cdot M) \cdot \left(\frac{h_{AA} \cdot (1 - M)}{1 + h_{AA} - r} + \frac{h_{MM} \cdot M}{1 + h_{MM} - r} \right) \quad \dots(15)$$

$$P_B = (b_B + b_F \cdot P_F + b_W \cdot W + g_B \cdot M) \cdot \left(\frac{h_{BB} \cdot (1 - M)}{1 + h_{BB} - r} + \frac{h_{MM} \cdot M}{1 + h_{MM} - r} \right) \quad \dots(16)$$

$$P_K = (b_K + b_F \cdot P_F + b_W \cdot W) \cdot \left(\frac{h_{KK}}{1 + h_{KK} - r} \right) \quad \dots(17)$$

where b_F and b_W are the parameters that measure the effect of input prices on the firms' marginal costs (which are assumed to be identical for the three major firms), **and** g_A and g_B are the parameters that measure the changes in the marginal costs of Arcor and Bagley as a consequence of efficiencies imputable to their merger¹⁰.

The system of equations to be regressed, therefore, consists of five logarithmic demand equations (5, 6, 7, 8 and 13) and three supply price equations (15, 16 and 17). Being a demand-and-supply model, we considered prices (P_A , P_B , P_K , P_O and P_M), quantities (Q_A , Q_B , Q_K , and Q_O) and market shares (S_A , S_B , S_K , and S_O) as endogenous variables, while Y , P_F and W were considered to be exogenous. We also used a set of additional (instrumental) exogenous variables, formed by 11 monthly dummy variables, three annual dummy variables, and the Argentine consumer price index. In order to exploit possible correlations among the residuals of the estimated equations, we used iterative three-stage least squares (3SLS) as our estimation method. This is a method that combines the use of instrumental variables with the estimation of a matrix of correlation coefficients between the different equations. We also assumed the existence of

⁹ We have also tried to use other variables, such as the price of milk, the price of vegetable oil, the price of sugar, the price of chocolate, the price of electricity, the price index of machines used for the production of food and beverages, the index of capacity utilization in the industry of food and beverages, the consumer price index, and the wholesale price index. None of them improved our results, and we ended up with a specification that was based solely on the behavior of P_F and W .

¹⁰ This way to analyze the effects of a merger on prices and costs is typical of the so-called "clinical econometric studies" of mergers. For a review of several studies of this sort, and also for the description of alternative empirical techniques, see Pautler (2001).

an autoregressive process of the AR(1) type, which allowed us to estimate the serial correlation coefficient r .

Estimation Results

The data set that we used to perform the estimation of the model described earlier consisted of 39 monthly observations from January 2003 to March 2006. Provided that we are running a system of eight different equations, the total number of observations is equal to 312. For each month, we had the price, quantity, and market share data for Arcor, Bagley, Kraft and the other (minor) biscuit producers, whose source is the same database that we used in the Argentine Biscuite Market, elaborated by the consulting firm A C Nielsen. The data set was completed with some public information elaborated by the Argentine Institute of Statistics and the Census (INDEC), which basically consists of indices such as the CPI, the monthly Economic Activity Estimator (EMAE), the index of the price of flour and the registered private sector wage index. Using the CPI and the EMAE, we elaborated a monthly index of consumers' nominal income, which was the estimator of the variable Y . The results of the estimations performed, following the methodology described earlier, can be seen in Table 2¹¹.

Table 2: Demand and Supply Regression Results				
Variable/Results	Coefficient	Std. Error	t-statistic	Probability
Logarithmic Demand Equations				
Constant Arcor	13.0750	0.0383	341.3779	0.0000
Constant Bagley	13.2521	0.0377	351.8376	0.0000
Constant Kraft	13.2524	0.0398	333.1976	0.0000
Constant Others	13.2792	0.0391	339.3242	0.0000
Constant Arcor/Bagley	13.8672	0.0381	364.0985	0.0000
Own-price Elasticity Arcor	-0.9444	0.0098	-96.4261	0.0000
Own-price Elasticity Bagley	-0.9322	0.0098	-94.8685	0.0000
Own-price Elasticity Kraft	-0.9324	0.0099	-93.7778	0.0000
Own-price Elasticity Others	-0.9299	0.0096	-96.6865	0.0000
Own-price Elasticity Arcor/Bagley	-0.8672	0.0098	-88.2824	0.0000
Elast Substitution Majors	1.0084	0.0099	101.3729	0.0000
Elast Substitution Majors/Others	1.0087	0.0096	104.6593	0.0000
Serial Correlation	0.7015	0.0286	24.5309	0.0000
Supply Price Equations				
Constant Arcor	2.6910	0.2293	11.7375	0.0000
Constant Bagley	3.2693	0.2473	13.2184	0.0000
Constant Kraft	3.0277	0.2431	12.4565	0.0000
Price of Flour	0.0020	0.0007	2.9509	0.0034
Wage Index	0.0078	0.0010	7.4566	0.0000
Dummy Merger Arcor	-0.1596	0.0439	-3.6355	0.0003
Dummy Merger Bagley	-0.2168	0.0454	-4.7720	0.0000
Serial Correlation	0.7916	0.0506	15.6580	0.0000

¹¹ Note that, to reduce the number of coefficients to estimate, we assumed that all the coefficients that measure elasticities of substitution between the major firms (Arcor, Bagley and Kraft) were identical, and we also used a single coefficient to measure the elasticity of substitution between any of those firms and the other firms. The serial correlation coefficients for the five demand equations, moreover, were assumed to be the same, and we also estimated a single serial correlation coefficient for the three supply price equations.

If we look at the results in Table 2, we find that all the estimated coefficients are statistically significant at a 1% probability level. They also display the right signs in all cases, since the five estimated own-price elasticities are negative, the two elasticities of substitution are positive, the two serial correlation coefficients are numbers between 0 and 1, the two input price parameters are positive, and the two merger-specific cost parameters are negative (i.e., they indicate that the merger generated a reduction in Arcor's and Bagley's marginal costs).

We also find that the demand equation constant for the minor firms is slightly higher than the demand equation constants for Kraft and Bagley, and that those constants are in turn higher than Arcor's. This is consistent with the fact that, taken as a group, the minor firms have a market share which is slightly higher than Kraft's and Bagley's, which in turn have larger market shares than Arcor (Table 1).

On the supply price equations, the constant for Bagley is higher than the constant for Kraft, which is in turn higher than the constant for Arcor. This is consistent with the fact that, during the period under analysis, Bagley's average price was higher, followed by Kraft's and Arcor's (Table 1).

Using the coefficients reported in Table 2, and the average market shares reported in Table 1, it is possible to calculate the implied long run Marshallian elasticities for the products considered in the estimation. These are the ones that appear in Table 3. Note that these elasticities fulfill the homogeneity restriction (since, for each product's demand equation, they add up to zero). They also fulfill the symmetry restriction, since they are based on symmetric elasticities of substitution¹².

Equation/Variable	Price Arcor	Price Bagley	Price Kraft	Price Others	Nominal Income
Arcor's Demand	-3.1643	0.2594	0.2564	0.2687	2.3798
Bagley's Demand	0.2115	-3.1234	0.2526	0.2648	2.3945
Kraft's Demand	0.2135	0.2580	-3.1239	0.2673	2.3851
Others' Demand	0.2109	0.2549	0.2520	-3.1158	2.3980
Arcor's+Bagley's Demand	-2.9055	-2.9055	0.2561	0.2684	2.3810

Firm	Pre-Merger	Post-Merger
Arcor	31.60	34.42
Bagley	32.02	34.42
Kraft	32.01	32.01

Using the figures that appear on Table 3, it is possible to calculate the profit-maximizing price/cost margins for Arcor, Bagley and Kraft, both before and after the Arcor/Bagley merger. These are the ones reported in Table 4.

The estimations performed by running the demand-and-supply econometric model are useful to make some comparisons between pre-merger and post-merger market behavior. For example, as we know that the average post-merger biscuit prices for Arcor and Bagley are equal to 6.5427 and 7.2607 ARS\$/kg, respectively (Table 1), we can also estimate that their corresponding post-merger marginal costs are equal to 4.2907 and 4.7616 ARS\$/kg (provided that their price/cost

¹² Note that the symmetry restriction does not imply that the Marshallian cross-price elasticities are symmetric. This is because those elasticities also depend on the values estimated for the income elasticities and on the average market shares, which are not identical for the different products.

margin is equal to 34.42%, as reported in Table 4). If Arcor and Bagley had not merged, however, these marginal costs would have been higher, by a sum equal to 0.1596 ARS\$/kg for Arcor, and equal to 0.2168 ARS\$/kg for Bagley (Table 2). On the other hand, their price/cost margins would have been lower, and equal to 31.60% for Arcor and 32.02% for Bagley (Table 4). The estimated average prices for the 2005-06 period if Arcor and Bagley had not merged, therefore, would have been equal to 6.5036 ARS\$/kg for Arcor and 7.3233 ARS\$/kg for Bagley. These figures imply that Arcor's prices increased by 0.6% and Bagley's prices decreased by 0.85% as a consequence of the merger.

Using the figures calculated in the previous paragraph, it is possible to estimate the change in consumers' surplus that occurred as a consequence of the Arcor/Bagley merger. Provided that the average monthly biscuit quantity sold by Arcor in the post-merger period is equal to 5,935,113 kg, and the average monthly biscuit quantity sold by Bagley in the same period is 5,935,167 kg (Table 2), then the estimated price changes generated a reduction in Arcor's consumers' surplus of ARS\$ 232,063 per month, and an increase in Bagley's consumers' surplus of ARS\$ 371,541 per month (that is, a monthly net gain of ARS\$ 139,478).

Another figure that merits calculation as an estimation exercise is the total amount of the productive efficiency gains detected. These are equal to ARS\$ 947,244 per month for Arcor and ARS\$ 1,286,744 per month for Bagley (i.e., a total monthly gain of ARS\$ 2,233,988). These figures appear when we multiply the estimated marginal cost reductions by the actual quantities traded during 2005-06.

Conclusion

The analysis suggests that the decision of the Argentine competition authorities concerning the approval of the Arcor/Bagley merger was in general correct, since the behavior of the Argentine biscuit market after that merger was consistent with a situation in which competition did not suffer from the increase in market concentration that the merger implied. Looking at the main figures of the market, we see that the average price of biscuits in Argentina was slightly higher in 2005-06 than in 2003-04, but that price increase was considerably smaller than the Argentine inflation rate. We also see that the total monthly biscuit consumption increased by 19.4% in the post-merger period, and that the aggregate market share of the Arcor/Bagley group increased from 47.39% to 47.54%, while the market share of its main competitor (Kraft Foods) decreased from 26.79% to 24.22% (Table 1).

The cause why the market performed in that way, however, is not exactly the same that the Argentine competition agency (i.e., the CNDC) predicted when it recommended the merger to be approved. This is because the degree of market power of Arcor and Bagley seems to have increased in comparison to its pre-merger level, due to a change from a situation in which they faced demands, whose long run own-price elasticities were equal to -3.1643 and -3.1234 , respectively, to a situation in which they face a demand whose long run own-price elasticity is equal to -2.9055 (Table 3). This reduction in their own-price

elasticity implies that the firms have now the possibility of charging higher price/cost margins which, absent any cost reductions, would have implied long run price increases of 4.3% for Arcor biscuits and 3.7% for Bagley biscuits¹³.

But the merger between Arcor and Bagley seems to have generated some important productive efficiency gains that were partially passed on to the consumers, and those gains seem to have more than counterbalanced the market power increases, especially for the case of Bagley's products. That is why total consumers' surplus seems to have grown as a consequence of the merger, at least during the first fifteen months of operation of the newly merged entity.

The results obtained in the study, however, are dependent on the data that we used to find them. It is, therefore, possible that, with data from other periods of time, some of these results are altered. Notwithstanding, the methodology that we used to find the results is relatively general, in the sense that it can be applied to other cases and scenarios to test for the existence of market power and cost reduction effects generated by any merger that occurs in a particular differentiated product market. It is also more effective than the methodologies based on the observation of accounting cost data, since it is able to separate cost changes that are imputable to input price changes from cost changes that are imputable to the merger itself. ↴

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¹³ Note that these predicted price increases, however, are smaller than 5%, which is the threshold that most competition authorities around the world use when they evaluate the possible prohibition of a merger.