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The Effect of Horizontal Mergers on Efficiency and Market Power: An Application to the Argentine Hamburger Market

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Abstract: This paper analyzes the behavior of the Argentine hamburger market during the period 2013-2018, to see if an important merger that occurred by the end of 2015 (the BRF/MRP merger) had any discernable market-power or efficiency effects. To do this, we run an econometric demand-and-supply model, and we find that there is an appreciable cost reduction that more than counterbalances the price increases induced by the merger. This implies that total consumers' surplus may have grown as a consequence of the merger.

Key words: Merger, hamburger, Argentina, market power, efficiency
JEL codes: C32, L13, L41, L66

1. Introduction

By the end of 2015, there occurred in Argentina a relatively important merger transaction that implied the acquisition of a series of food brands previously owned by the firm Molinos Río de la Plata (MRP). The acquiring group was Brasil Foods (BRF), and the total amount of the transaction was reported to be around US$ 44 million (Sanguinetti, 2015). The brands acquired by BRF corresponded to different products, that were sold in markets in which BRF was previously present. One of those was the Argentine hamburger market, in which BRF already owned the brand Paty and was the firm with the highest revenue share. Within the group of brands acquired by BRF, there were two hamburger bands previously owned by MRP: Good Mark and Wilson. The first of them was particularly important in the Argentine market, since it was one of the closest competitors of Paty.

If we consider the effect of the BRF/MRP merger on the Argentine hamburger market, we are clearly before a horizontal merger that increased the market share of the main firm. Indeed, the revenue share of BRF in the years previous to the merger (2013-2015) was around 53%, while the share of MRP was around 8%. The rest of the market was supplied by other firms, among which we can mention Swift (18%) and Paladini (3%).

In a situation like this, it is possible that a transaction such as the BRF/MRP merger generates an increase in price due to a unilateral market power effect (i.e., due to the increase of the market power of the acquiring firm). It is nevertheless possible that the transaction also implies an efficiency gain, due to possible cost reductions in the activities of the merging firms. This last effect may induce a price reduction rather than a price increase, and can occur simultaneously with the market power effect.[1]

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[1] Due to a rather strange situation, the effects of this transaction were not analyzed by the Argentine competition authority (CNDC). This occurred because BRF argued that the transaction was not an "actual merger" but only a "brand acquisition", that should not be subject to antitrust scrutiny. This interpretation was opposed by the CNDC, but it was finally accepted by the court of appeals that

In this particular case, we already have data that corresponds to the first three years of operation of BRF in the Argentine hamburger market after the BRF/MRP merger. We are therefore able to evaluate the possible existence of market power and efficiency effects, and their relative impacts on the prices of the different brands of hamburgers sold in Argentina. This is basically the aim of this paper, and in order to do that we will use both a descriptive approach (comparing the real figures before and after the merger) and an analytic approach (using an econometric model of demand and supply).

The structure of this paper will be the following. In section 2 we will briefly describe the Argentine hamburger market in the period 2013-2018, and the main changes that we can detect when we compare the immediate pre-merger period (2013-2015) with the immediate post-merger period (2016-2018).[2] In section 3 we will describe the demand-and-supply econometric model that we will use to analyze those changes, while section 4 will be devoted to report the results obtained. In section 5, finally, we will summarize the main concluding remarks of the whole paper.

2. The Argentine Hamburger Market

As we have already mentioned in the introduction of this document, the Argentine hamburger market during the period 2013-2018 has been supplied by several brands controlled by different firms such as BRF, MRP and others. The main data concerning the market is summarized on Table 1, where we can see the evolution of real prices, total quantities and revenue market shares.[3]

Table 1 Argentine Hamburger Market Figures

Concept / Year	2013	2014	2015	2016	2017	2018
Average prices (Arg$/kg)						
BRF	58.05	59,59	59.21	56.71	52.22	48.19
MRP	61.52	62,68	63.12	63.00	63.77	62.03
Others	41.59	42,65	45.66	44.38	41.38	39.05
Quantities (tn)						
BRF	16529	15379	20071	20072	20608	19061
MRP	2948	2350	2051	1180	692	440
Others	16065	16762	18064	18210	18195	17563
Revenue shares (%)						
BRF	53.04%	51.52%	55.46%	56.33%	57.45%	56.30%
MRP	10.02%	8.28%	6.04%	3.68%	2.36%	1.67%
Others	36.94%	40.19%	38.50%	39.99%	40.19%	42.03%

Source: Own calculations based on data from A. C. Nielsen.

From the figures of Table 1 we can clearly see that the BRF/MRP merger implied a large reduction in the revenue share of the brands previously owned by MRP. This reduction was accompanied by an increase in the share

reviewed the case (Cámara Federal de Apelaciones en lo Civil y Comercial de la Ciudad de Buenos Aires).

[2] This post-merger period roughly coincides with the time when BRF controlled the hamburger brands under analysis, since by the end of 2018 that firm sold its entire hamburger business in Argentina to another company called Marfrig.

[3] All the information concerning the Argentine hamburger market that we use in this study comes from data sets elaborated by the consulting firm A. C. Nielsen. The prices are expressed in Argentine pesos of January 2013, and have been deflated using the consumer price index of the city of Buenos Aires (elaborated by the General Direction of Statistics of the Government of the City of Buenos Aires).

of the brands that were already possessed by BRF (basically Paty), but it also meant an increase in the market share of the brands supplied by other firms. As a consequence of the merger, therefore, the joint market share of BRF and MRP went from 61.5% (in 2015) to slightly less than 60% (in the period 2016-2018).

The evolution of real prices, however, did not signal a price increase due to higher market concentration. Quite the contrary, the average real price of the original BRF brands decreased 18.6% between 2015 and 2018, and this decrease was higher than the one experienced by the brands not affected by the merger ("Others"), which was equal to 14.5%. The average real price of the brands previously owned by MRP, conversely, decreased only 0.2%, and this is a possible explanation of the large reduction in the share of those brands (and in the corresponding quantities sold).

As we can observe on Figure 1, however, the reduction in the share of the MRP brands did not begin in the moment of the BRF/MRP merger (end of 2015) but several months earlier, since by 2014 that share (8.28%) was considerably smaller than the one for 2013 (10.02%). This can be due to the fact that the average real prices of the MRP brands were always higher than the ones for the original BRF brands (and also higher than the average prices of the brands outside the merger). This can be seen on Figure 2, where those average real prices are represented for the whole 2013-2018 period.

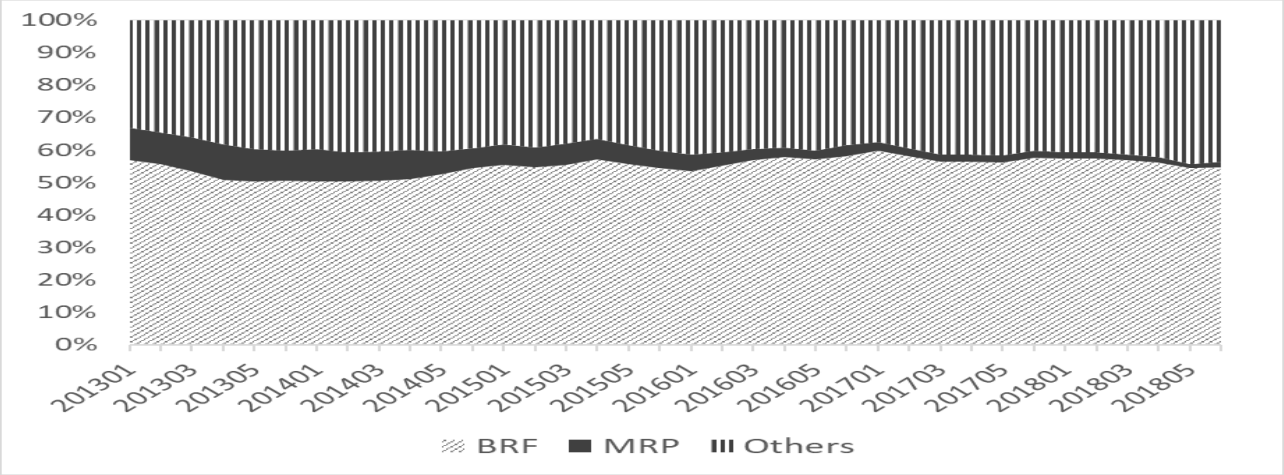

Figure 1 Revenue Market Shares (in%)

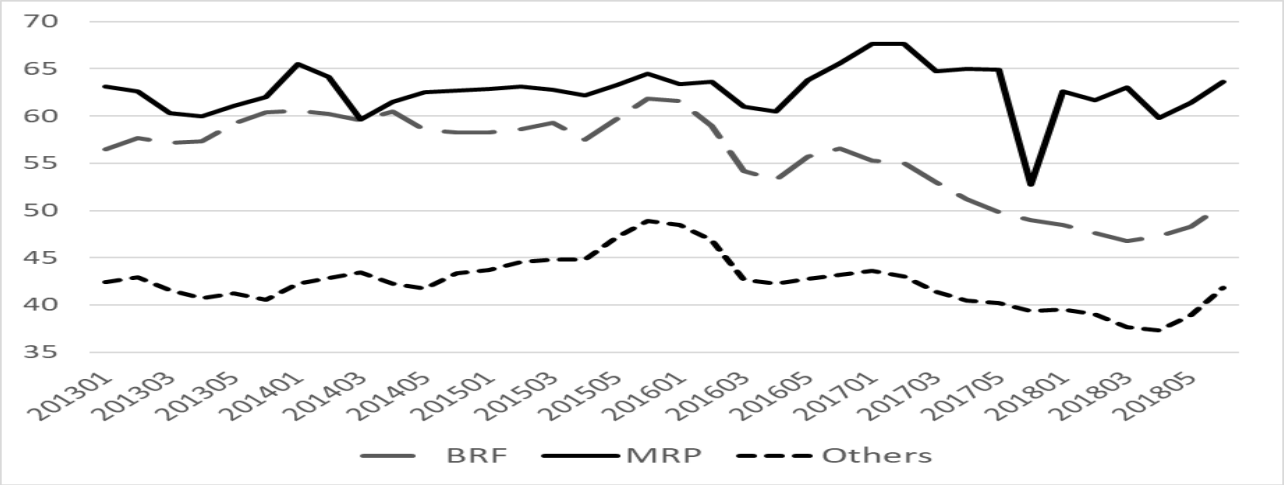

Figure 2 Average Real Prices (in Arg$/kg of January 2013)

3. An Econometric Model of Demand and Supply

The differences in the prices and quantities traded before and after the BRF/MRP merger might be explained by several factors. Some of them could be related to changes in demand due to changes 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 hamburgers. Finally, a third group of factors could be imputed to the merger itself, through market power or cost reduction phenomena. In this section we will develop a model aimed at sorting out those possible interrelated factors[4].

The available alternatives to model the demand for hamburgers depend on the definition of the products that we want to consider. As we are mainly interested in using demand to analyze the exercise of market power by the acquiring firm, we decided to use a single demand function for the whole market, and a logarithmic specification. This consists of estimating relationships between the logarithm of the products' traded quantity (dependent variable) and the logarithms of several independent variables (i.e., prices and income).[5]

In the case under analysis, our logarithmic demand function has the following form:

$$\ln(Q_h) = \alpha_h + \beta_{hh} \cdot \ln(P_h) + \beta_{hs} \cdot \ln(P_s) + \beta_{hY} \cdot \ln(Y) + \rho \cdot \ln(Q_{h(t-1)}) \quad (1)$$

where Q_h is the quantity of hamburgers; P_h is the price of hamburgers, P_s is the price of sausages (which is supposed to be a substitute good for hamburgers), Y is the consumers' income, and $Q_{h(t-1)}$ is the quantity of hamburgers bought in the previous period.

The coefficients of this demand function have a direct economic interpretation, which is related to the concept of elasticity. Therefore, β_{hh} can be interpreted as the short-run own-price elasticity of hamburgers, while β_{hs} is seen as the short-run cross elasticity of hamburgers with respect to the sausages' price. Correspondingly, β_{hY} is the short-run income elasticity of the demand for hamburgers, while ρ is the coefficient of serial correlation between the quantities demanded in two consecutive periods of time.

The figures obtained can also be used to estimate long-run elasticities. By dividing the corresponding elasticity coefficients by "$1-\rho$", it is possible to obtain estimates for the long-run own-price, cross and income elasticities of demand. The demand function itself, moreover, can also be modified to include the so-called "homogeneity restriction", that implies that the sum of all price and income elasticities must add up to zero.[6] In our case, this means writing the following function:

$$\ln(Q_h) = \alpha_h + \beta_{hh} \cdot \ln(P_h / Y) + \beta_{hs} \cdot \ln(P_s / Y) + \rho \cdot \ln(Q_{h(t-1)}) \quad (2)$$

and defining β_{hY} as equal to "$-\beta_{hh} - \beta_{hs}$".

Concerning the supply function, the easiest way to conceive it is to write it as a "supply price function", whose dependent variable is the price of the acquiring firm's products (in this case, the price of BRF hamburgers). This function can be seen as the sum of a component that depends on the marginal cost of the supplied product, plus an

[4] 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.

[5] 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).

[6] For a more complete explanation of these demand function transformation in the context of merger simulations, see Coloma (2011).

additional component that represents the profit margin. Both components can vary before and after the analyzed merger, due to efficiency and market power effects.

In particular, for the case of the merger under analysis, the supply price function can be written in the following way:

$$P_{brf} = \gamma_b + \gamma_m \cdot Merge + \mu_b \cdot P_h \cdot (1 - Merge) + \mu_m \cdot P_h \cdot Merge \quad (3)$$

where P_{brf} is the price of BRF hamburgers, P_h is the average price of all hamburgers (which is the same variable used in the demand function), and *Merge* is a dummy variable that takes a value equal to zero for the period before the BRF/MRP merger (2013-2015) and a value equal to one for the period after the BRF/MRP merger (2016-2018). Under this specification, the coefficient γ_b represents the marginal cost of BRF hamburgers before the merger, while "$\gamma_b + \gamma_m$" stands for the marginal cost of BRF after the merger. Conversely, "$\mu_b \cdot P_h \cdot (1\text{-}Merge)$" is BRF's profit margin before the merger, while "$\mu_m \cdot P_h \cdot Merge$" is BRF's profit margin after the merger.

Combining the demand and supply specifications embedded in equations (2) and (3), it is possible to re-write equation (3) including the elasticity and serial correlation coefficients estimated in equation (2). This implies writing the supply price function in the following way:

$$P_{brf} = \gamma_b + \gamma_m \cdot Merge + \theta_b \cdot \frac{(1-\rho)}{\beta_{hh}} \cdot P_h \cdot (1 - Merge) + \theta_m \cdot \frac{(1-\rho)}{\beta_{hh}} \cdot P_h \cdot Merge \quad (4)$$

where θ_b and θ_m are "conduct parameters", that represent the pricing behavior of BRF before and after the analyzed merger.[7]

In particular, under the specification stated in Eq. (4), we can see θ_b and θ_m as numbers that should lie between zero and one. If it holds that one of these parameters is equal to zero, then this means that the firm's pricing behavior is equivalent to that of a firm with no market power. Conversely, if one of these parameters is equal to one, then this means that the firm's pricing behavior is equivalent to that of a profit-maximizing unregulated monopolist.

In order to estimate the coefficients of the proposed model, it is necessary to run a system of regressions formed by equations 2 and 4. Being a demand-and-supply model, we must consider hamburger prices (P_h) as an endogenous variable, while Y, P_s, $Q_{h(t-1)}$ and *Merge* are considered to be exogenous. We also used a set of additional exogenous variables, formed by five bimonthly dummy variables, a trend variable, and the inverse of the Buenos Aires consumer price index. The estimation method used was iterative two-stage least squares (2SLS), which is the most practical method to thoroughly deal with endogeneity issues.

4. Estimation Results

The data set that we used to estimate of the model described in the previous section consisted of 36 bimonthly observations from the period 2013-2018. Provided that we are running a system of two equations, the total number of observations is equal to 72. As we are including a lagged variable ($Q_{h(t-1)}$), this number is further reduced to 70 observations. For each bimester we have price and quantity data for hamburgers, both for the whole market and for the BRF brands. Those data came is basically the same one used in the tables and figures of section 2.

The data set used in our empirical exercise was completed with some public information elaborated by the Argentine Institute of Statistics and the Census (INDEC) and by the General Direction of Statistics of the

[7] For a more complete explanation of these concepts, in the context of merger analyses, see Coloma (2007).

Government of the City of Buenos Aires, which basically consisted on indices such as the CPI and the monthly economic activity estimator (EMAE). Using those indices we built a bimonthly index of consumers' nominal income, which was our estimator of the variable *Y*. The main results of the estimations performed, following the methodology described in the previous section, can be seen on Table 2.[8]

Table 2 Demand and Supply Regression Results

Variable/Results	Coefficient	Std. Error	t-statistic	Probability
Logarithmic Demand Equation				
Constant	0.760258	1.574114	0.482975	0.6310
Own-Price Elasticity Hamburgers	-0.014805	0.151143	-0.097952	0.9223
Cross Elasticity Sausages	0.076825	0.111426	0.689473	0.4933
Serial Correlation	0.961487	0.101931	9.432764	0.0000
Supply Price Equation				
Marginal Cost Pre-Merger	0.367870	0.275744	1.334099	0.1875
Dummy MC Post-Merger	-0.196003	0.293595	-1.348805	0.1827
Conduct Parameter Pre-Merger	0.100123	1.238079	0.080870	0.9358
Conduct Parameter Post-Merger	0.251668	5.468115	0.082600	0.9345

Using the results reported on Table 2, we can calculate a long-run own-price elasticity for hamburgers which is equal to -0.3837. With that number, together with the pre-merger conduct parameter, we can estimate a pre-merger margin for BRF hamburgers which is equal to 0.07475. Comparing that margin with the estimated pre-merger marginal cost (equal to 0.36787), we find that the average pre-merger BRF margin for hamburgers was around 16.9% of the corresponding price.

If we repeat the exercise for the post-merger period, we find a margin for BRF hamburgers which is now equal to 0.17175. As our results signal that the marginal cost dropped -0.196003, then the post-merger marginal cost becomes equal to 0.171867. If we now use those number to calculate the average post-merger BRF margin for hamburgers, this increases to 49.98% of the corresponding price.

However, if we take together the margin increase and the cost reduction induced by the merger, our estimations show that the real price index of BRF hamburgers went from a total of 0.4426 to a total of 0.3406, which means a real price reduction of 23.04%. This number is consistent with the one reported in section 2, in which we found a reduction of 18.6% of the average BRF hamburger prices between the years 2015 and 2018.

Using the figures calculated in the previous paragraph, it is also possible to estimate the change in hamburger consumers' surplus that occurred as a consequence of the BRF/MRP merger. Provided that the average annual hamburger quantity sold by BRF in the post-merger period was equal to 19,913,662 kg (see Table 1), then the estimated price change generated an increase in the BRF's consumers' surplus of Arg$ 259,011,400 per year (measured at constant prices of January 2013).[9]

[8] This estimation has been performed using EViews 10. The complete estimation results are shown in appendix 1.

[9] This number is approximately equal to US$ 51,802,280, since in January 2013 the exchange rate between the Argentine Peso and the US Dollar was around US$ 5 per Arg$. That figure takes into account the fact that the average BRF hamburger price was around US$ 11.79 per kg between 2013-2015, and suffered an estimated decrease of 23.04% in the post-merger period. Using the estimated long-run own-price elasticity for hamburgers, the 19.91 million kg sold annually between 2016 and 2018 would have become 18.23 million kg (if prices had remained equal to the pre-merger values). All these figures allow to calculate an area below the hamburger demand curve, which totals the US$ 51.8 million already mentioned.

5. Concluding Remarks

The analysis performed in the previous sections suggests that the effect of the BRF/MRP merger was in general favorable to the Argentine hamburger consumers, since it induced a price decrease and a quantity increase (especially for the brands manufactured by BRF). This result, however, is not due to a reduction in the degree of unilateral market power that the merging company had in the Argentine hamburger market. Quite the contrary, that degree of market power seemed to have increased due to the merger. Nevertheless, the BRF/MRP transaction seems to have induced an important cost reduction that was partially passed through consumers, probably influenced by the fact that other hamburger producers (e.g., Swift, Paladini, etc.) may have increased their productive efficiency levels as well.

The results obtained in our study, however, are dependent of the data that we used to find them. It is therefore possible that, with information from other periods of time, some of these results are altered. Notwithstanding, the methodology used 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 market. It is also more effective than methodologies that are based solely in the observation of accounting cost data, since it is able to separate price changes that are imputable to exogenous variables from price changes that are imputable to the merger itself.

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Appendix 1 Complete Estimation Results

System: SYSTEMHAMBURG1
Estimation Method: Iterative Two-Stage Least Squares
Date: 11/25/19 Time: 14:19
Sample: 2 36
Included observations: 35
Total system (balanced) observations 70
Convergence achieved after 3 iterations

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.760258	1.574114	0.482975	0.6310
C(2)	-0.095061	0.016496	-5.762803	0.0000
C(3)	-0.052280	0.019564	-2.672307	0.0098
C(4)	-0.041768	0.018095	-2.308279	0.0246
C(5)	-0.035245	0.016697	-2.110892	0.0392
C(6)	-0.017834	0.016647	-1.071274	0.2886
C(8)	-0.014805	0.151143	-0.097952	0.9223
C(9)	0.076825	0.111426	0.689473	0.4933
C(11)	0.961487	0.101931	9.432764	0.0000
C(21)	0.367870	0.275744	1.334099	0.1875
C(23)	-0.196003	0.293595	-1.348805	0.1827
C(24)	0.100123	1.238079	0.080870	0.9358
C(25)	0.251668	5.468115	0.082600	0.9345
Determinant residual covariance		4.37E-08		

Equation: LOG(QHTOTAL) = C(1) +C(2)*BIM02 +C(3)*BIM03 +C(4)*BIM04
+C(5)*BIM05 +C(6)*BIM06 +C(8)*LOG(PHTOTAL/YNOM) +C(9)
*LOG(PSTOTAL/YNOM) +C(11)*LOG(QHTOTAL(-1))
Instruments: C BIM02 BIM03 BIM04 BIM05 BIM06 LOG(YNOM)
LOG(PSTOTAL) LOG(QHTOTAL(-1)) FUSION 1/IPC TEND
Observations: 35

R-squared	0.812292	Mean dependent var	15.65130
Adjusted R-squared	0.754536	S.D. dependent var	0.075876
S.E. of regression	0.037592	Sum squared resid	0.036742
Durbin-Watson stat	1.937568		

Equation: PHBRF/IPC = C(21) +C(23)*MERGE -C(24)*(1-C(11))/C(8)
PHTOTAL/IPC(1- MERGE) -C(25)*(1-C(11))/C(8)*PHTOTAL/IPC
* MERGE
Instruments: C BIM02 BIM03 BIM04 BIM05 BIM06 LOG(YNOM)
LOG(PSTOTAL) LOG(QHTOTAL(-1)) MERGE 1/IPC TREND
Observations: 35

R-squared	0.966678	Mean dependent var	0.449109
Adjusted R-squared	0.960933	S.D. dependent var	0.037523
S.E. of regression	0.007417	Sum squared resid	0.001595
Durbin-Watson stat	1.019877		