Investigating the impact of Private Labels on National Brand prices in the Italian yogurt market

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Summary

Using a panel data set on the yogurt market for four hundred points of sale in Italy, we investigate, at the segment level, the interactions between private label (PL) market shares and national brand (NB) leader's prices. We estimate a reduced form model which controls for the heterogeneity of point of sales and time using a two way fixed effect (FE) error components model (ECM). Consistently with several theoretical findings available in the literature, we expect retailers to use PL to discriminate prices among different groups of consumers. The analysis, however, shows not all segments of the market are influenced by PL shares. Specifically, for the most dynamic segments (functional and yogurt with snack), Pl shares are on average smaller and NB leader's prices are not affected by their presence. Differently, in the most traditional segments (whole and skimmed yogurt), where PL exhibits on average a sizable presence, the analysis shows a positive effect between PL shares and NB prices. Results suggest leader's product innovation and product introduction dynamics might play a role on retailer's power to influence NB leader's prices, retaining PL development.

Keywords: *Private Label, Dairy market, Price Competition*

JEL Classification codes: Q13 D40 L11

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1. INTRODUCTION

Over the past two decades retailers have invested many resources on creating their own branded products and on their development and expansion in many segments of the market. Offering their own brands, retailers strategically "are less dependent on specific upstream suppliers, reinforce their bargaining power position and can extract more profits" (Bontemps et al., 2008).

Retailers have many incentives to expand private label (PL) share. First, PLs generate higher margins than national brands (NBs) (Sayman et al 2002; Pauwels and Srinivasan, 2004). In markets where profits shrink, retailers with high level of PL shares have been found to have more stable performance with respect to other competitors (Ailawadi et al. 1995). Furthermore, PL might have a central role on gaining consumer loyalty (Corstjens and Lal, 2000; Seenivasan et al., 2009; Ailawadi et al., 2008). In particular, high level of PL share has a significant role in increasing the so-called wallet share[1], the share of items purchased, and the share of shopping trips (Ailawadi et al., 2008). On the supply side, retailers selling PL put pressure on NB and may be able to lower wholesale prices with the manufactures (Narasimhan and Wilcox, 1998; Meza and Sudhir, 2010). For instance, it is not surprising that lowering PL's shares is a major challenge for NB manufactures (Kumar and Steenkamp, 2007), while retailers tend look for strategies to increase their PL share.

Moreover, retailers and manufactures can actively adopt marketing mix features to lead a PL share expansion or contraction. One of the marketing strategies retailers might decide to adopt is the proliferation of PL to reach a wider consumer base. However, the introduction of economy and premium PL does not always lead to PL expansion, and sometimes it may even benefit NB incumbents (Geyskens et al., 2010). Premium PL introduction might lead to attract more consumers in a premium segment and NB incumbent might be overall advantaged. On the other side, "an economy PL introduction always advantage mainstream-quality NBs because these become a compromise or middle-option in the retailer's assortment on the quality-tier dimension" (Geyskens et al., 2010). Nevertheless, analyzing the Italian Fast-Moving Consumer Goods (FMCG) market higher PL assortment share is being recognized as a key factor on explaining the growth of PL sales among different product categories (Fornari et al., 2013). The authors pointed out that the assortment share in the Italian retailer market can be of two different natures depending on the branding life cycle of the retailers. A first type is due to the introduction of products in

[1] Share spent in a chain as a total share spent on supermarket products.

new categories, if the retailer is at the initial phase of its branding life cycle. Otherwise, for retailers in the most advanced stages of the life cycle a higher PL assortment share is usually driven by the introduction of new extension lines or new product lines. Overall, retailers can more effectively gain market share having a higher PL shelf space visibility than competing with the use of intense promotion activity and price reductions (Fornari et al., 2013). Moreover also promotion intensity and in particular coupons offered by manufactures have been found to effectively deter PL growth in the US cheese market (Bouhlal and Capps, 2012).

A second field of research looks at the effect of the PL share and expansion on average category prices (Bronfrer and Chintagunta, 2004; Gabrielsen et al., 2002; Ward et al., 2002; Bontemps et al.,2005 and 2008; Sckokai and Soregaroli, 2008; Gabrielsen et al. , 2002). Despite the considerable number of studies developed in this area, there are still open questions on the effect of PL development on prices. For instance both empirical and theoretical research predicts mixed results.

On the theoretical side, Gabrielsen and Sorgad (2007) have highlighted a dual purpose served by PL. First, the introduction of a PL can be seen as a threat to elicit lower wholesale prices from NB manufactures. Further, once the PL is introduced, its presence can give the opportunity to the retailer of discriminating prices among different types of consumers. For instance, research has shown that demographic characteristics have a significant role on the probability of buying a PL (Bouhlal and Capps, 2012). Under certain assumptions, given the option of price discriminating, the introduction of a PL might lead to higher NB prices (Gabrielsen and Sorgad, 2007).

Moreover, the empirical literature provides conflicting evidence. Using data on sales along 104 weeks in 5 stores, Bonfrer and Chintagunta (2004) have analyzed the impact of PL entry on several product categories. They found mixed results. In half of the categories retailers raise the NB prices, while in the rest they allow the incumbent brand to fall. Similarly, Sckokai and Soregaroli (2008), analyzing the Italian market, have found different relationship between NB prices and PL share depending on different products categories. Chintagunta et al. (2002) have found a significant decrease of the prices of the leading NB and promotion activity in the US cereal market due to a PL introduction.

Other studies have found mainly positive relationship between PL share and NB prices (Ward et al., 2002; Bontemps et al., 2005 and 2008; Gabrielsen et al. 2002). Ward et al. (2002), analyzing several product categories in the US market, have found the increase of PL share is correlated with higher NB prices, but the average price of the market, considering both PL and NB products, remains unchanged. Bontemps et al. (2005), analyzing the French market and taking into account different types of alternative products, have found a positive relationship between PL share and NB prices (if the PL in *"sensu stricto"* are considered[2]), while an increase in hard discount and first price share will have opposite effect in half of the cases analyzed. Focusing on the PL in "*sensu stricto*" and dividing them into three different groups (me-too, low-price and premium PL), Bontemps et al. (2008) have found standard PL (me-too) have the strongest impact on increasing NB prices while premium PL exhibit no significant effect. Similarly, Gabrielsen et al. (2002), analyzing the introduction of PL in Norway for several product categories, have found mostly non-significant or few significant positive effects on NB prices.

[2] The authors classify all PLs exclusively developed by retailers in "*sensu stricto*". They distinguish them from hard discount products and first price products.

In this paper, using a detailed panel data set for the Italian yogurt market at the point of sale level, we'd like to further investigate the relationship between PL share and NB prices. We refer to the reduced form models implemented first by Ward et al. (2002) and further modified by Bontemps et al. (2005, 2008) and Sckokai and Soregaroli (2008). We implement a two way fixed effect (FE) error component model (ECM) controlling for heterogeneity of points of sales and time (week). Moreover, we repeat the analysis for each segment where PL are present. Differently from previous work, our analysis looks primarily at the relationship between PL market share and leader prices. We select the leader as the brand most sold in a point of sale and segment with the highest frequency, as further explained in the next section.

Consistently with the theoretical prediction made by Gabrielsen and Sorgad (2007) that PL might be used from retailers to price discriminate among different groups of consumers since demographics characteristics have an important role on the probability of buying a PL (Bouhlal and Capps, 2012), we found a positive effect of the presence of PL share on leader's NB prices for two major segments (*Whole* and *Skim yogurt*), where PL shares are sizable. Differently, in other two segments (*Functional* and *Yogurt with snack*), where PL are not highly developed, we found PL shares have no effect on Leader's prices. As shown in Kadiyali et al. (1999) in their empirical analysis for the US yogurt market, the line-extension is a valuable strategy implemented by manufactures to gain price setting power over the incumbents. Considering the PL to be one of the incumbent, NB leaders might use the presence in more dynamic segments to retain retailer's pricing power.

2. DATA DESCRIPTION AND METHODS

To analyze the impact of PL shares on NB prices we follow the methodology first introduced by Ward et al. (2002) and later modified by Sckokai and Soregaroli (2008) and Bontemps et al. (2005, 2008). We use scanner data from SymphonyIRI on the yogurt market in Italy. Our database records brand level weekly prices and sales, with and without promotion, for 400 points of sales which belong to 14 different retailing chains along 156 weeks from January 2009 to January 2012. All points of sales in the sample are located in Italy although we do not observe the geographical location. For each point of sales we observe the retail chain it belongs to as well as its store format (hypermarket, supermarket or superette)[3]. Furthermore, in our data set, retail chains, manufacturers and brands, beside the indication of PL, are blinded by letters code for confidentiality. For each category of data, IRI provide a division of the market in subcategories. In particular, the yogurt market is divided in 4 sub-categories: whole, fat free, with snack and functional. Moreover, we focus just on the segments where PLs are present.

Using the data available for each product category we compute the (natural logarithm of the) weekly average price of the NB leader (if the brand is leader more than 70% of the weeks) or the (natural logarithm of the) weighted average of the prices of the NB leader and co-leader (if each of the two brands is leader over less than 70% of the weeks). Moreover we compute other control variables such as the PL market share (in value) in a given week, sub-category and point of sale, the total volume of product sold and the number of brand units sold[4]. We exclude from our analysis the observations where the PL market

[3] Discount stores are not included in our sample.

[4] Since we do not observe the Universal Product Code (UPC), we define a brand unit as the interaction of segments, manufacturers, brands and packaging attributes.

share is equal to one, as we are not able to observe the corresponding national brand prices. Thus, our final data set is an unbalanced panel.

Table 1 shows the descriptive statistics for the yogurt market. The share of PL in value exhibit a sizeable variation among and within segments, showing that the penetration of PL is not homogenous among market segments and there are important differences among point of sales and over time. Specifically, PL products have a high penetration in the *Whole* and *Skim* segments where the average share is respectively 13% and 22%. On the contrary, the PL share in the *Functional* and *Yogurt with snack* segments is much lower more contained with average values below 4%.

Table 1: Summary statistics - Yogurt market by segments

	Mean	Std Dev	Minimum	Maximum
Whole				
Price (€/kg)	3.8163	0.5970	1.2400	7.2900
PL share in value	0.1316	0.1051	0	0.9531
Total Volume Sold (ton/week)	1.2079	1.5598	0	13.3680
Number Brand Units	42.6366	20.2990	1	135
Skim				
Price (€/kg)	4.2742	0.8071	1.2800	8.2200
PL share in value	0.2219	0.1685	0	0.9865
Total Volume Sold (ton/week)	1.2123	1.5612	0.0010	13.3680
Number Brand Units	21.5492	11.9970	1	60
Yogurt with snack				
Price (€/kg)	5.7269	1.0455	1.6450	19.3300
PL share in value	0.0221	0.0629	0	0.9565
Total Volume Sold (ton/week)	1.2172	1.5627	0	13.3680
Number Brand Units	5.5969	2.7108	1	16
Functional				
Price (€/kg)	5.6127	1.0000	2.6386	10.4000
PL share in value	0.0404	0.0552	0	0.8095
Total Volume Sold (ton/week)	1.2104	1.5605	0.0020	13.3680
Number Brand Units	18.3605	7.6263	1	50

Source: Our elaboration on SymphonyIRI data.

3. ECONOMIC SPECIFICATION AND ESTIMATION

To evaluate the role of PL shares on the behavior of the leader's price we consider the regression model:

$$y_{it} = \mathbf{x}'_{it}\boldsymbol{\beta} + \mu_i + \nu_t + u_{it} = x'_{it}\beta + \varepsilon_{it}, \quad (1)$$

where y_{it} is the dependent variable; $\mathbf{x}_{it}$ a k vector of explanatory variables, $\boldsymbol{\beta}$ a k vector of parameters, μ_i the point of sales effect (indexed $i = 1, \dots, N$), ν_t the time-specific effect (indexed $t = 1, \dots, T$), u_{it} the remainder error term and ε_{it} the composite error term.

Hence, defining the n × N matrix $\boldsymbol{\Delta}_{\mu}$ and the n × T matrix $\boldsymbol{\Delta}_{\nu}$ and using matrix notation, we can write the model:

$$\mathbf{y} = \mathbf{X}\boldsymbol{\beta} + \boldsymbol{\Delta}_{\mu}\boldsymbol{\mu} + \boldsymbol{\Delta}_{\nu}\boldsymbol{\nu} + \mathbf{u} = \mathbf{X}\boldsymbol{\beta} + \boldsymbol{\varepsilon}, \tag{2}$$

where $\mathbf{X}$ is a n × k matrix of explanatory variables, $\boldsymbol{\mu}$ the N × 1 vector of point of sales-specific effects, $\boldsymbol{\nu}$ the T × 1 vector of time-specific effects, $\mathbf{u}$ the n × 1 vector of residual disturbances and $\boldsymbol{\varepsilon}$ the n × 1 vector of composite error terms.

The within transformation of the two-way ECM (see Davis, 2002) is:

$$\mathbf{Q}_{\Delta_{2w}} = \mathbf{Q}_{\mathrm{A}} - \mathbf{P}_{\mathrm{B}} \tag{3}$$

with

$$\begin{aligned} \mathbf{P}_{\mathrm{A}} &= \boldsymbol{\Delta}_{\mu}\boldsymbol{\Delta}_{\mathrm{N}}^{-1}\boldsymbol{\Delta}_{\mu}' && \rightarrow \mathbf{Q}_{\mathrm{A}} = \mathbf{I}_{\mathrm{n}} - \mathbf{P}_{\mathrm{A}} \\ \mathbf{P}_{\mathrm{B}} &= \mathbf{Q}_{\mathrm{A}}\boldsymbol{\Delta}_{\nu}(\boldsymbol{\Delta}_{\nu}'\mathbf{Q}_{\mathrm{A}}\boldsymbol{\Delta}_{\nu})^{-}\boldsymbol{\Delta}_{\nu}'\mathbf{Q}_{\mathrm{A}} \end{aligned} \tag{4}$$

with $\boldsymbol{\Delta}_{\mathrm{N}} = \boldsymbol{\Delta}_{\mu}'\boldsymbol{\Delta}_{\mu}$ and $\mathbf{I}_{\mathrm{n}}$ is the identity matrix of dimension n. Therefore the fixed effect (FE) estimator is:

$$\boldsymbol{\beta}^{\mathrm{W}} = \left(\mathbf{X}'\mathbf{Q}_{\Delta_{2w}}\mathbf{X}\right)^{-1}\left(\mathbf{X}'\mathbf{Q}_{\Delta_{2w}}\mathbf{y}\right). \tag{5}$$

where μ_{i} and ν_{t} are assumed to be fixed parameters and $u_{it} \sim \mathrm{IID}(0, \sigma_u^2)$.

Hence for each segment the following semi-logarithmic model is estimated:

$$\begin{aligned} ln(\mathrm{P_{it}}) = \quad & \beta_1 \cdot \mathrm{SharePL_{it}} + \beta_2 \cdot \mathrm{vol_{it}} + \beta_3 \cdot \mathrm{BU_{it}} + \\ & + \beta_4 \cdot \mathrm{leader_{it}} + \beta_5 \cdot \mathrm{prom_{it}} + \beta_6 \cdot \mathrm{PLprom_{it}} + \mu_{\mathrm{i}} + \nu_{\mathrm{t}} + u_{it} \end{aligned} \tag{6}$$

where *leader* is a dummy indicating whether the brand (or brands) is leader for a given i (point of sale) and t (week), *promotion* a dummy indicating whether the brand (or brands) is on promotion, and *PL promotion* a dummy indicating whether the PLs are on promotion.

When performing the estimation we take into account that the PL shares might be endogeneous. Following Bontemps et al. (2008), since endogeneity is mainly related to the demand side, we select exogenous instrument with explanatory power on the market shares: the PL market shares of other segments in the yogurt market and their lagged values. We test for both validity and relevance of our instruments using respectively the Hansen J overidentification test[5] and the first stage F-stat, as reported in the table of results (Table 2). Using a fixed effect estimator we account for point of sale and week heterogeneity and we cluster the error for each point of sale.

4. RESULTS AND DISCUSSIONS

Results for the yogurt market are reported in Table 2. The use of the semi-logarithm form allows us to have a straightforward interpretation of the continuous regressors in (6) as an estimated percentage change of the dependent variable for a small change on the independent variable. To similarly interpret the parameters of the fixed effects we need to apply a transformation, since, being the dummy variable in dichotomous form, the derivative of the dependent variable with its respect does not exist. Halvorsen et al. (1980) have proposed a transformation of the coefficient of a dummy variable which lead to the right interpretation of their effect. Let's φ be the parameter of a dummy variable, and g be the relative effect on the dependent variable on the presence of the factor presented by the dummy variable. Then, $g = \ln(1 + \varphi)$ and the relative effect on the dependent variable is $g = \exp(\varphi) - 1$ (Halvorsen et al. 1980). The coefficients reported in Table 2 have been transformed when needed.

[5] We use Stata's xtivreg2 command which provide the Hansen J or Sargan overidentification test by default.

The FE model estimated for whole and skimmed yogurt shows a significant and positive effect of the PL market share on the NB leader price. Our model predicts that a one percentage point increase of the PL share leads to a 0.27% increase in the leader's price for the Whole yogurt and a 0.54% increase for the Skim yogurt. These results are in line with other empirical studies (Bontemps et al. 2005, 2008; Ward et al. 2002). PLs might be used by retailer to price differentiate among different groups of consumers. For instance, the theoretical model by Gabrielsen and Sorgad (2007) predicts that, under certain circumstances, the presence of a PL can lead the retailer to price discriminate with the results of setting higher price for NB products.

Table 2: Results for the fixed effects model. Yogurt market by segments.

	Whole	Skim	With snack	Functional
PL share in value	0.2698**	0.5400***	-0.3318	-0.0921
	(0.1215)	(0.1592)	(0.2485)	(0.3431)
Total volume sold	-0.0142***	-0.0028	-0.0197***	-0.0246***
	(0.0020)	(0.0025)	(0.0027)	(0.0037)
Number Brand Units	0.0008**	0.0007	-0.0065***	0.0020***
	(0.0003)	(0.0010)	(0.0014)	(0.0006)
Leader†	-0.0245***	-0.0396***	-0.0350***	ه-.0307 ***
	(0.0032)	(0.0054)	(0.0040)	(0.0039)
Promotion†	-0.0812***	-0.0829***	-0.1850***	-0.1426***
	(0.0032)	(0.0052)	(0.0030)	(.0030)
PL promotion†	-0.0073*	-0.0217***	0.0403*	0.0072
	(0.0039)	(0.0071)	(0.0240)	(0.0064)
Observations	61993	61753	61489	60663
Number of clusters (Points of sale)	400	400	400	400
R-squared	0.2584	0.2920	0.3973	0.3875
P-value Hansen J test	0.5975	0.2547	0.1144	0.1652
F test first stage	20.12	21.32	19.01	14.10
IV				
a) PL share of other segment plus the 1-lagged average of the PL shares in other segments	yes	yes	yes	
b) 1, 2, 3 and 4 weeks lagged average of PL shares in other segments				yes

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

† transformation of the coefficients of dichotomous variables when using a semi-logarithmic form (Hanvorrsen R., R. Plamquist, 1980).

Differently, for the other two segments, the PL share does not seems to have an impact on the leader's prices. In this analysis, we cannot identify the reasons of this result. Summary statistics (Table 1) show that PL share is much lower on these two segments with respect to the former, so we may hypothesize that the results are due to a less intense competition between leader and PL. Alternatively, assuming the retailer might set both prices, through an intense product differentiation NB leaders can retain some of the retailer's power on setting their prices. However, these are just hypothetical explanations, that need to be tested through further research.

Results show mixed effect on the assortment strategy variable (number of brand units). For instance, we found more brand units in the shelf can lead to higher NB leader's prices in two of the four segments (Functional and Whole), while this effect is negative in the Yogurt with snack segment and insignificant in the Skim segment. However, even when they are significant, such effects are very small.

Regarding the intensity of promotion activity by PL, we found different responses of the NB leader's prices depending on the segments: negative for Skim and Whole, slightly positive or not significant for Functional and Yogurt with snack.

Finally, the Leader and the Promotion dummies exhibit the expected results. In particular all the coefficients are negative and significant for both variables. When the leader brand is on promotion, its price is lower ceteris paribus, Further, when the brand is actually leader, it exhibits lower prices, meaning that the leadership position may be reinforced by promotion activities.

Table 2 also reports the set of instruments used in each estimated model as well as the results from the validity of the instruments test (Hansen J test) and the relevance test (first stage F-stat).

5. CONCLUSIONS

This analysis investigates the impact of the PL share on the NB leader's price in the Italian yogurt market. We estimate, at the segment level, a two way fixed effect model to control for time and point of sales heterogeneity. Moreover, we control for possible endogeneity bias using an instrumental variable approach and testing for their validity and relevancy. We found two major effects. In particular, in market where PLs have been introduced from many years and have a relevant market share, an increase in such share leads to an increase in the NB leader's prices, since PLs may be used by retailers to price differentiate among different groups of consumers. This is in line with several previous studies, both theoretical and empirical.

Further, in segment where the PL shares are smaller, the NB leader's prices seem to be not affected by their presence. Our model is not able to determine the reasons behind this finding. However, we can hypothesize this effect is due to a less intense competition between PL and NB leaders, validated by the lower PL market shares. In fact, through product differentiation and line extension into more dynamic segments, NB might be able to retain some of the retailer's power on price setting.

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