Impact of private label development across retail formats: Evidences from the Italian dairy market

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Summary *– In the European food sector private labels represent a relevant and increasing share of total sales. Focusing on price strategies, recent theoretical papers conclude that private label development should cause a decrease in the price of national brands, while some empirical studies do not support this prediction. The aim of this study is to explore this empirical relationship for the Italian dairy sector. Using retail sales data, we study how prices of national brands react to private label growth. We find that the impact of private label development on national brand prices is product specific: a negative impact is registered by industrial products such as butter and mascarpone and by highly differentiated products such as yogurt. Positive effect is found in the case of traditional cheeses produced by strong national brands.*

Keywords: *private label, pricing, retail sector, dairy products*

Impact du développement des marques de distributeurs selon le type d'enseigne : le cas des produits laitiers en Italie

Résumé – En Europe, les marques de distributeurs (MDD) représentent une part importante et croissante du chiffre d'affaires de la grande distribution. En matière de stratégies de prix, des travaux théoriques récents montrent, contrairement à d'autres travaux plus empiriques, que l'essor des MDD entraîne une baisse des prix des marques nationales (MN). L'objectif de l'article est d'analyser cette relation de façon empirique dans le secteur des produits laitiers en Italie. En utilisant des données de vente au détail, nous étudions l'effet du développement des MDD sur le prix des MN. Nos résultats montrent que cet impact est spécifique au produit : il est négatif pour des produits industriels (beurre, mascarpone) et pour des produits fortement différenciés (yaourt), il est positif dans le cas des fromages traditionnels pour lesquels les MN sont fortes.

Mots-clés : marque de distributeur, prix, distribution de détail, produits laitiers

Descripteurs JEL : L110, L660, L810, M310

1. Introduction and literature review

In the European food sector, Private Labels (PL) represent a relevant and increasing share of total retail sales. Their market share ranges from 10 to 40% depending on the country, a share that tends to increase with the concentration of the retail sector.

The introduction of PL products in EU supermarkets goes back to the late '70s, when they were viewed as a cheap and generic substitute for National Brands (NB) products. Their quality was well below that of the market leader and their main role was that of addressing the needs of low-income consumers, since their introduction was linked to periods of economic recessions. PL products were typically produced by small and medium enterprises working under contract for the main retail chains. In the late '80s and early '90s, the consumers' perception of PL changed, since the PL average quality substantially increased, due to both technological advances and to production by name-brand firms. In fact, some NB producers started to adopt the so-called "dual-branding strategies", producing both NB and PL products. Their choice was often due to the employment of the excess capacity of their plants, but also to reduce conflicts with retailers, in order to obtain easier shelf access also for their NB products.

During this process, different kinds of PL have been developed. The key element of the PL assortment is always the so-called "store brand", in which a set of products carries directly the retailer's name, which is very evident on the packaging. Thus, they reflect the image of the retail chain and contribute to its reputation among final consumers. In some cases we may have the so-called "store sub-brands", in which the name of the retailers is part of the brand but it is less evident. The so-called "umbrella brand" is a name that is used for a wide range of PL products of different categories, which has nothing to do with the retailer's name. These brands are often used to label lower quality products, which compete with "first price" generic products, on which the retail chain does not want to spend directly its reputation. Finally, in some cases, we have specific PL brands used only in one-product categories, either to promote some "exclusive" added value products or simply some low-price sets of products.

The reasons that make PL products strategically interesting for retailers are well known: when they play the role of Store Brands (*i.e.* their brand coincides with the retailers' own name), their main purpose is to increase consumer loyalty to the retail chain. This is done offering a balanced quality/price ratio on an increasing set of products, typically ranging from standard grocery products to fresh products (dairy, meat, fruits and vegetables), to which consumers are particularly sensitive in choosing their preferred food outlet. Moreover, PL products typically guarantee higher average margins to retailers, since their advertising and promotion expenditures can be spread across a wide range of products. Their role is also very important in influencing the relationships between retailers and manufacturers. Thanks to their PL portfolio, retailers may increase their bargaining power in terms of price and shelf access policies for NB producers, and the fact that some of the leading manufacturers are engaged in dual branding strategies shows how strongly PL development has influenced the vertical relationships along the food supply chain.

The economics of PL products has received relatively little attention by researchers: a recent paper by Berges-Sennou *et al.* (2004) surveys this literature, that

tries to answer some basic economic issues. Of course, the first problem concerns the reasons that lead retailers to sell PL products, but, around this basic question, other important research issues arise, like the analysis of the factors favouring the introduction and the success of PL, the choice of the characteristics of PL, their impact on the vertical relationships between retailers and manufacturers and on competition among retailers (among the theoretical papers addressing these issues, see Mills, 1995 and 1999; Bontems *et al.*, 1999; Steiner, 2004; Soberman and Parker, 2004; Gabrielsen and Sorgard, 2007).

The increasing availability of data reporting sales trend related to single brands and/or single retail chains/stores, typically collected by private market research firms (*i.e.* AC Nielsen, IRI and others), has created further opportunities for empirical research. In fact, the increasing relevance of PL products has raised a number of issues that cannot be unambiguously solved by the theory. In one of the earlier studies, Dhar and Hoch (1997) find some evidences that the PL share is positively related to the use of the chain name on the brand, the amplitude of the PL portfolio, the intrinsic quality of the PL products and the number of stores selling that PL, while an aggressive price policy has a positive influence only for lower quality categories. Sudhir and Talukdar (2004) find evidences that the presence of PL has a positive impact on store profits, which leads them to confirm the interpretation of PL as a powerful differentiation tool for retailers. Sayman and Raju (2004a) find some positive effects of PL proliferation in a given store/chain on PL sales of a specific product, thus confirming the positive interaction given by the use of the same brand, while it is not clear whether promotional activities in a given PL category may enhance PL sales in other categories. Finally, the same authors (2004b) find that retailers tend to create more PL in the same category when there are more NB of similar strength; in this case, each PL tends to imitate one specific NB in the market.

Clearly, one of the hot issues in this research area is the price competition between PL and NB. In fact, since PL tend to compete directly with NB, the latter need to adapt their marketing strategies to deal with this growing competition. According to what may be labelled as "conventional wisdom" on the impact of PL development, NB producers should respond in three ways: lowering NB average prices, engaging in more promotional activities on their products and further differentiating NB products from PL.

Focusing on the first type of response, the stylized fact that PL development should cause a decrease in NB prices is well established among both economists and industry representatives. Some recent theoretical papers, based on a framework that analyses the vertical relationships between two monopolists, a retailer and a manufacturer, support this view (Mills, 1995; Bontems *et al.*, 1999).

However, Ward *et al.* (2002) review a set of factors that may lead to an increase in NB prices as a response to PL development. The simplest explanation is related to quality: if NB manufacturers react further differentiating their products, they may increase their quality, thus leading to an increase in NB prices. In general, however, many theoretical papers show that product differentiation strategies may lead to either a decrease or an increase in prices depending upon the characteristics of the market and the

degree of differentiation among products. Other reasons may be related to the consumers' uncertainty generated by brand proliferation, which may induce NB producers to exploit "ignorant" consumers with higher prices. This could be especially important for those firms implementing "dual branding strategies". For the specific case of PL entry and development, the paper by Gabrielsen and Sorgard (2007) supports the idea that, under some circumstances, NB prices may increase. They show that, considering two different types of consumers (those loyal to NB products and those willing to switch from NB to PL), if the number of loyal consumers is large enough, NB price would increase as a response to PL introduction. In general, their main contribution to this field of theory is that the form of the final demand is a key factor in determining the reaction of manufacturers to PL development. A related result, mainly focused on the role of advertising, can be found in Soberman and Parker (2004), who demonstrate the NB price-enhancing effect of PL development when firms can discriminate between customers who want advertised NB products and those that do not.

Given this conflicting theoretical interpretations, the empirical analysis of the impact of PL development on NB prices becomes extremely important. Some recent papers have already produced some results, and some of them seem to support the view that NB prices have increased as a result of PL development. This is the prevailing result of Ward *et al.* (2002), who studied 34 product categories in the US market, showing that the increase in price is accompanied by a decrease in NB advertising activities. Bontemps *et al.* (2005a and 2005b), studying 21 product categories in the French market, show that such an increase in NB prices may be partially explained by a strategy of product differentiation, and that NB manufacturers' reaction differs depending on the type of PL products they are facing. Gabrielsen *et al.* (2002), studying 83 product categories in Norway, find prevailing positive reaction of NB prices to PL development and detect a stronger price response for the leading brands. Among the papers studying the dairy sector, Bonanno and Lopez (2004) found prevalently positive response of fluid milk prices to PL expansion in selected US cities.

However, other similar papers have obtained the opposite result. Putsis (1997) analysed 135 product categories in the US market, finding a negative impact of PL expansion on NB prices. The same type of result has been obtained by Chintagunta *et al.* (2002) for the breakfast cereal market, while Bonfrer and Chintagunta (2004) have obtained mixed results.

Thus, further evidences are needed to interpret the reaction of NB manufacturers to PL development. The objective of this paper is to estimate the price reaction of NB to the introduction of PL dairy products in Italy. This case study is of special research interest, since the Italian food retail sector has undergone a dramatic change in the last 10 years. In fact, the share of the first five buying groups of retailers was 26% in 1996 and it is now over 70%, while the PL share in the food market has doubled from 6 to 12% [1]. The share of modern retail chains in total food sales is around 60%, even

[1] The absolute level of the PL share in Italy is clearly quite small as compared to other EU countries, but it is rapidly increasing and this may affect future developments of both the food retail and manufacturing sectors.

though we observe wide variations across product categories and across different regions of the country.

The dairy sector is also especially interesting for this type of analysis, since it provides a variety of products, ranging from standard industrial products (liquid milk, butter, yoghurt, processed cheeses) to Protected Denomination of Origin (PDO) cheeses. These different types of products typically display different demand characteristics and are also produced by different types of firms. In fact, while industrial products are typically produced by a few national or multinational dairy companies, in sectors which are highly concentrated, PDO products are typically produced by a large number of small and medium enterprises. Clearly, the bargaining power of retailers toward these two categories of firms is totally different, and this may influence the NB price dynamics and its relationship with PL development.

To carry out our estimations, we use *ACNielsen* retail sales data (organised by semester) of 16 dairy products for the period 1994-2005, distinguished by type of brand (NB *vs* PL) and by retail channel (super/hypermarkets and superettes). We construct time series of market shares and prices for both NB and PL, together with other structural indicators, and then we analyse the relationship between NB prices and PL development. In section 2 we present the model we have used, while in section 3 we describe the data and the estimation techniques. In section 4 we present our results, while in section 5 we draw some conclusions.

2. Estimated model

As in similar papers discussed in the previous section, this paper adopts *ad hoc* models to estimate the relationship between NB prices and PL development, since there is no clear behavioural model that can explain NB manufacturers' response. Following Ward *et al.* (2002) and Bontemps *et al.* (2005a and 2005b) we start from the following simplest model:

$$\ln PNB_{ijt} = \alpha_{1ij} + \alpha_{2ij} D_{sem} + \alpha_{3ij} trend + \beta_{ij} \ln PLSH_{ijt} + \varepsilon_{ijt} \quad (1)$$

where PNB_{ijt} is the (real) price of NB for dairy product category i in retail channel j at time t, $PLSH_{ijt}$ is the corresponding PL market share, D_{sem} is a dummy variable for the two semesters, *trend* is a linear time trend, and ε_{ijt} is the error term.

Compared with the above papers, the most relevant feature of model (1) is that we also estimate different parameters/elasticities for different retail channels (super/ hypermarkets and superettes).

Since the dynamic of NB price is likely to be affected by other factors than simply the evolution of the PL share, we have also augmented the model in (1) with other structural variables that may be relevant in this context [2]. The two variables that are available in our database are the (log) measures of the concentration ratio in the

[2] In some recent empirical papers, Putsis and Cotterill (1999) and Cotterill and Putsis (2000) clearly show that the pricing strategies of both manufacturers and retailers are strongly influenced by the NB share in the relevant market and by the level of retailers' concentration.

manufacturing sector for each product ($CR4_{ijt}$) and the share of modern retailers in each market ($MRSHijt$). These variables, that can be considered as proxies of market power by manufacturers and retailers respectively, are included into the model in alternative ways: separately, jointly, and interacted with PL share. Finally, other factors affecting NB prices should be captured by the time trend.

3. Data and estimation techniques

The *ACNielsen* retail sales dataset covers 26 dairy products sold in the Italian market, among which we have selected the 16 products for which PL versions are available. The database provides data on quantity and value of sales by semester distinguished for each retail channel (super/hypermarkets, superettes, hard discounts, specialty outlets, traditional shops) and, of course, for the whole market. Inside each channel we can further discriminate among (value and quantity) sales of the four leading brands, of PL products and of other brands.

NB are therefore defined as the four leading brands for each product and retail channel, with their share corresponding to the definition of $CR4_{ijt}$. This approximation captures the main brands for each product/channel in the dataset with the exception of the Asiago cheese, where the $CR2_{ijt}$ definition is used since only two leading brands are acting in the market. Thus, nominal NB prices are computed taking the value of sales of the four leading brands divided by the corresponding quantity, and they are converted in real prices using the Consumer Price Index (CPI) as normalisation factor.

Both the PL share and the concentration ratios are computed in value terms, while the modern retail share is computed as the sum of the value of sales in super/ hypermarkets, superettes and hard discounts divided by total sales.

The dataset covers 12 years (1994-2005) for most products [3] and is organised by semester. Thus, for most product categories, we have 24 observations to be used in our regression models.

For each product category and for the super/hypermarkets and superettes channels [4], model (1) is first estimated by Ordinary Least Squares (OLS), both in its simplest version and in its augmented versions, including either $CR4_{ijt}$ or $MRSH_{ijt}$ or both, eventually interacted with the PL share. For each estimated model we test for serial correlation and, when present, we correct it using exact maximum likelihood estimation [5]. Another estimation problem that may arise is that of endogeneity. In fact, the PL market share may be endogenous, since it may be influenced by the level of the NB prices, in the strategic game concerning the price strategies of both manufacturers and retailers. Thus, for each selected model (either OLS or exact maximum likelihood, depending on the test for serial correlation) we estimate the corresponding

[3] For Pecorino the time series starts in 1995 and for Asiago in 1996.

[4] We distinguish only super/hypermarkets and superettes, since only in these channels PL are relevant and well defined.

[5] This correction procedure, which avoids dropping the first observation as in the standard Generalized Least Squares, is performed by the econometric package TSP 5.0.

instrumental variable (IV) version. In order to select between the standard version or the IV version, we perform the Hausman test for endogeneity [6]. Finally, in order to select the best model among the different estimated versions (standard or augmented), we consider the BIC criterion.

4. Results and discussion

4.1. Total retail level

Table 1 shows the main statistics for the relevant variables of the Italian dairy sector over the sample period. Trends coefficients are computed regressing the dependent variable on a constant, a dummy variable for the semester, and a linear trend. As for the model described in the previous section, when serial correlation is present, we correct the model using exact maximum likelihood estimation.

Table 1. **Market shares (%) and prices (€/kg) of Private Label (PL) and National Brands (NB), with their corresponding trends in the Italian dairy sector**

	Shares				Prices			
	PL		NB [a]		PL		NB	
	2005	Trend	2005	Trend	2005	Trend	2005	Trend
Asiago	11.2	0.76***	1.4	– 0.23***	8.69	– 0.49**	9.36	– 0.87*
Butter	19.8	0.91***	23.5	– 0.64***	5.35	– 2.67***	7.00	– 1.03*
Caciotte	0.1	– 0.04**	18.6	0.67	9.96	0.05	11.27	– 0.09
Emmenthal	5.8	0.00	29.3 [b]	1.48***	8.87	– 1.34**	9.46 [b]	– 1.73***
Processed cheese (slices)	12.9	0.53***	78.6	0.06	4.16	– 4.46***	6.14	– 4.30***
Processed cheese (portions)	1.7	0.11***	80.5	– 0.26	5.63	– 2.75***	8.68	– 1.48***
Gorgonzola	2.4	0.13***	49.8	– 0.64***	9.90	– 0.54	10.53	– 1.81***
UHT milk	18.1	0.47**	55.1	0.17	0.61	– 3.45***	1.03	– 1.85***
Mascarpone	17.3	1.46***	65.3	– 0.91***	5.36	– 3.34***	7.49	– 1.64***
Mozzarelle	8.7	0.68***	27.2	– 0.84***	5.13	– 3.12***	8.17	– 2.21***
Pecorino	1.4	0.12	2.4	0.14***	11.30	– 1.01	12.84	3.55***
Provolone	1.5	0.06	66.9	2.27***	9.96	– 0.65**	11.49	– 1.14***
Ricotta	4.9	0.38***	29.7	0.60***	2.81	– 0.99**	4.77	– 0.92***
Stracchini	5.3	0.44***	60.8	– 0.53	7.36	– 1.72***	9.25	– 0.89***
Taleggio	2.8	0.20***	46.8	0.21	9.22	– 0.18	12.09	– 0.36**
Yogurt	11.1	0.75***	60.1	– 0.86***	2.30	– 2.65***	4.37	– 2.41***

Note: Trend is recomputed as absolute change per year for shares and as % variation per year for prices. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.
[a] measured as CR_4 (CR_2 only for Asiago); [b] 2002.

[6] In each equation, we use as instruments the constant term, the independent variables (including the trend) and the farm-level price of raw milk. In the IV model corrected for serial correlation, we also include the lagged dependent variable as instrument, following the suggestion by Fair (1970).

The market share of PL is still quite low for many Italian dairy products. Butter reaches the highest share (19.8% in 2005), but only five other products display a double-digit value (yogurt, UHT milk, Mascarpone, processed cheese in slices and Asiago). The case of Asiago is especially interesting, since it is the only PDO cheese showing a relevant PL share (11.2% in 2005), while for the others (Gorgonzola, Pecorino, Provolone, Taleggio) the PL share ranges from 2 to 4%.

In general, trend coefficients are positive for virtually all products and reach very high values for products like Asiago, butter, Mascarpone, Mozzarelle and yogurt, which display a yearly absolute change of their PL market share from + 0.5% to + 1.5%. Hence, there is clearly a positive development trend of PL products in the Italian dairy market.

The market share of NB (computed as *CR*4) gives an indication of the structure of the sectors. Concentration is very low for two PDO products, Asiago and Pecorino, where production is fragmented and farmers are often involved in processing, mainly through cooperative structures. On the contrary, high concentration ratios are observed for industrial products like processed cheeses, Mascarpone and yogurt, but also for a PDO cheese like Provolone, which is typically produced by a few large firms located in the North of the country. There is no clear sign of evolution in the concentration of the industry that seems to be product specific. The higher process of concentration is for the Provolone cheese, a market where the leader brand "Auricchio" has adopted strong advertising campaigns in the last few years.

Prices for PL and NB are expressed in euro/kg and are deflated by the CPI (2000 = 1). NB real prices are always higher than the corresponding PL ones. The NB price mark-up, compared to PL, is over 50% for yogurt, Ricotta, UHT milk, Mozzarelle, and processed cheese portions, while price differences are much lower for traditional cheeses. This result is expected since traditional cheeses in very few cases have a recognised brand and in the packaging retailers often link the PL name with the PDO official denomination. Differently, yogurt shows a NB price that is almost double compared to the PL price, indicating that there is still a high differentiation between the two products.

Considering the dynamics of prices, most significant trend coefficients are negative for both PL and NB, thus showing a general declining trend in real dairy prices. This may come from different reasons: the growth of modern retail share, the decrease of raw milk price due to the reforms of the EU common agricultural policy [7], the product differentiation strategies implemented in different retail channels, the increase in the hard discount market shares, and, finally, the PL development. Since there is no clear answer to this phenomena, the empirical analysis carried out in this paper tries to investigate specifically this last issue.

Table 2 provides the results of the selected models from the econometric estimation of model (1) and its augmented versions. Of the 16 models, 6 are corrected for autocorrelation, while the others are estimated by OLS. The Hausman test did not identify endogeneity problems for the selected models.

[7] In real terms the average raw milk price from 1994 to 2005 decreased by 29%. Real prices of raw milk show a negative trend in the period, with the exception of 1995, 1998 and 2001, years in which the EU dairy market showed raising prices.

Table 2. **Parameter estimates of the selected models for the aggregate retail sector in Italy**

Product	Model[a]	Parameters						
		$lnPLSH_{ijt}$	$lnCR4_{ijt}$	$lnMRSH_{ijt}$	$lnCR4_{ijt}$* $lnPLSH_{ijt}$	$lnMRSH_{ijt}$* $lnPLSH_{ijt}$	*Trend*	D_{sem}
Asiago	olsq	– 1.465**	– 0.608**	– 4.087	– 0.270***	– 2.011	– 0.91*	– 0.034**
Butter	olsq	– 2.257***	–	– 20.542***	–	– 9.314***	3.25***	– 0.011
Caciotte	olsq	– 0.125**	– 0.132	– 1.523***	– 0.043**	– 0.254***	0.38***	0.003
Emmenthal	olsq	0.018	1.014***	– 6.686**	0.473***	– 2.348**	0.63	0.004
Processed cheese (slices)	olsq	– 0.650***	– 5.140**	–	– 2.287***	–	– 3.62***	0.008
Processed cheese (portions)	ar1	0.024	–	–	–	–	– 1.95***	– 0.001
Gorgonzola	ar1	– 0.021	–	–	–	–	– 1.64***	0.004
UHT milk	olsq	– 0.018	– 0.531***	– 0.382***	–	–	– 1.05***	– 0.017
Mascarpone	olsq	– 0.040**	–	–	–	–	– 0.70*	0.056***
Mozzarelle	olsq	– 0.209***	–	– 3.085***	–	– 0.656***	– 1.77***	– 0.002
Pecorino	olsq	0.507	– 0.358	15.209*	– 0.113	3.259*	2.03	– 0.039*
Provolone	ar1	0.024**	–	–	–	–	– 1.23***	– 0.002
Ricotta	olsq	– 0.147*	– 0.218	–	– 0.100	–	– 1.22**	0.002
Stracchini	ar1	0.037***	–	–	–	–	– 1.53***	0.010***
Taleggio	ar1	0.022	–	–	–	–	– 0.65***	– 0.003
Yogurt	ar1	– 0.165*	–	–	–	–	– 0.23	0.005

Note: Trend is recomputed as % variation per year. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

[a] Estimation method: olsq= ordinary least squares; ar1 = correction for autocorrelation of degree1.

Control variables *CR4* and *MRSH* turned out to be important in explaining the evolution of NB price for several products, with an effect that is generally negative. An increase in concentration of NB producers reduces NB prices in the case of UHT milk, Asiago, and processed cheese slices. For the last two products, it also amplifies the negative effect of an increase in the PL share. For the case of Emmenthal, we obtain the opposite result, for both the single and the interacted effect. These prevailing negative results are quite difficult to interpret, since one expects that an increase in manufacturers' concentration provides room for an increase in their bargaining power that may results in rising (rather than declining) NB prices. However, a possible explanation may rely on the different role that each dairy product plays in the assortment of dairy companies. Emmenthal, for which we observe the expected behaviour, is one of the key products of Kraft, one of the leading multinational dairy producers, and an increase in the market share of Kraft certainly affects the price policy for Emmenthal. On the contrary, both UHT milk and processed cheese slices are less important in the corresponding assortment of the leading firms, since liquid milk producers' profits are heavily influenced by fresh milk sales rather than UHT milk sales, while processed slices are a residual product for most leading producers. Finally, the case of Asiago is totally different, since the leading brands have a very small market share and, at that level, any increase in their share is not able to affect the general price trend.

An increase in concentration of modern retail reduces NB prices for butter, Caciotte, Emmenthal, Mozzarelle, and UHT milk. The interaction effect with the PL share is also negative for all the above products, with the exception of UHT milk. We obtain opposite results only for Pecorino, although at a lower significance level. Here the prevalence of negative signs is in line with the expectations, since an increase in bargaining power by retailers, due to an increase in concentration, should give them more room for aggressive price policies on NB products.

Trend effects are significantly different from zero and negative in most cases, indicating that the structure of the models does not capture all of the factors driving the real NB price decline.

Table 3 shows the estimated elasticities of the impact of PL development on NB dairy prices in Italy, both at the aggregate level and distinguished by super/ hypermarkets and superettes. Each of the reported elasticities is computed from the selected model as a linear function equal to the sum of the *lnPLSHijt* parameter and the related interaction parameters (when included in the model), multiplied by the corresponding average values of *lnCR4ijt* and *lnMRSHijt*. Standard errors of the computed elasticities are obtained from the variance-covariance matrix of the parameters included in the linear function.

For what concerns the aggregate results (Total Retail), the elasticity results show no prevailing sign (5 negative, 4 positive). However, looking more carefully at the distinction by product category, most of the negative signs are for the more industrial products, while positive signs are for the traditional cheeses (with the exception of Pecorino).

Table 3. **Elasticity of National Brand (NB) price with respect to Private Label (PL) share for dairy products in Italy by retail channel (average 1994 – 2005)**

	Superettes	Super/ hypermarkets	Total Retail
Asiago	– 0.059*	0.050*	0.079*
Butter	– 0.476***	– 0.595***	– 0.554***
Caciotte	0.006	0.015**	0.025***
Emmenthal	– 0.069*	– 0.046	– 0.069***
Processed cheese (slices)	– 0.091**	– 0.100*	– 0.057
Processed cheese (portions)	0.040**	0.036	0.024
Gorgonzola	0.002	– 0.013	– 0.021
UHT milk	– 0.074	– 0.268**	– 0.018
Mascarpone	0.053*	– 0.052***	– 0.040**
Mozzarelle	0.002	0.083	0.038
Pecorino	– 0.070	0.108*	– 0.089**
Provolone	0.005	0.046*	0.024**
Ricotta	0.034**	0.033	– 0.008
Stracchini	0.010***	0.041**	0.037***
Taleggio	0.008**	– 0.014	0.022
Yogurt	– 0.235***	– 0.460***	– 0.165*

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

As reviewed in our introduction, while the "conventional wisdom" foresees a reduction in NB prices, some researchers have found a positive response of NB prices, providing evidences that this is partially related to the product differentiation strategies of the leading brands. Unfortunately, in our database we cannot construct any suitable indicator of product differentiation to be used as explanatory variable. Thus, our interpretation of the results is based on the qualitative knowledge of the characteristics of each channel and of each dairy product.

Butter and Mascarpone are examples of industrial product with standard characteristics and where little products differentiation is possible. In fact, their NB price reaction to PL development is negative, following the reasoning of the theoretical literature.

Product differentiation is also a possible explanation for the positive elasticity of two traditional cheeses: Provolone and Stracchini. As table 1 highlights, these two products show a high concentration of NB producers, that is either stable or increasing. As already mentioned, the market of Provolone is dominated by a strong leading brand, while in the Stracchini's segment multinational companies own well known brands (for example Lactalis owns the brand Galbani). Hence, the positive reaction of NB prices to PL share increase could be directly linked to the effective strategies of the leading brands. However, this explanation seems not to apply to the case of a more

industrialized product like Emmenthal, where the NB price response is negative although strong product differentiation strategies are implemented, given the presence of a multinational firm like Kraft. Probably, the existing price competition among NB plays a crucial role in determining the reaction to PL expansion.

However, in some cases product differentiation seems to work in the opposite way. For example, yogurt, that is mainly produced by large multinational firms, and for which product differentiation is very strong, has a negative response to PL concentration. One possible explanation of this behaviour may be based on the PL product differentiation strategies implemented by retailers. In fact, retailers have reacted to the NB manufacturers' product differentiation strategies implementing analogous strategies within their PL portfolio. Thus, it is becoming increasingly common to find a PL alternative for each version of yogurt available in the market, and in some cases the PL alternatives are the first to introduce some distinctive features. With this kind of competition between retailers and manufacturers, the room for charging higher NB prices as a response to PL growth becomes quite small and this may justify our negative elasticities. However, this interpretation should be taken with some caution, since the lack of brand proliferation indicators in our regression (for both NB and PL) may bias some of these results.

For what concerns the other traditional products, results are less conclusive and difficult to interpret. In general, we can claim that, for most of these products, strong product differentiation strategies are quite difficult to implement. In fact, traditional products have to follow precise product specifications and are produced by small and medium enterprises that normally have enormous difficulties in developing their own brand strategy, including advertising and promotion activities. Thus, the room for product differentiation strategies by NB manufacturers is quite small and it should not allow to charge a premium price for differentiated products. Thus, when the PL share increases, we do not expect a positive response in real NB prices.

For products like Pecorino, the negative elasticity at the total retail level may be related to the above reasoning. However, other products like Caciotte and Asiago show positive responses. While in the Caciotte's case the limited role of PL narrows the interpretation of results, for Asiago the result remains counterintuitive, leaving room for further investigation.

In general, the level of aggregation may be one of the source of bias in this set of results, as well as the lack of brand proliferation indicators (for both NB and PL), which are likely to influence the NB price dynamics. For this reason, we have investigated the same relationship distinguishing by retail channel.

4.2. Retail channels

The PL market shares take quite different values when we consider different retail formats (table 4). As expected, in super/hypermakets, the most important channel for dairy products, the PL share of most products is slightly higher than the national average, with the only exception of yogurt; here butter reaches the record high of 24.4%, while the PL market share of Mozzarelle reaches 11%. Trends are mostly in

line with those of the entire market, and the same is true, with a few exceptions, in the superette channel. Further detailed statistics at the retail channel level for the NB market shares, PL and NB prices, as well as the corresponding parameter estimates, are reported in the Appendix.

Considering the elasticities in table 3, results analysed for the aggregate market are confirmed for yogurt, Provolone, Stracchini, Caciotte, Emmenthal and butter.

UHT milk shows a negative elasticity in super/hypermarkets. In this case the interpretation is similar to the case of yogurt described in the previous section where the differentiation operated by retailers is very strong. In fact, UHT milk defined in our data can be considered as a differentiated product since the aggregate includes specialty milks like vitamin-added milk, lactose-free milk, omega3-added milk.

Distinction by superettes and hyper/supermarkets, while confirming results for some product, shows mixed signs for Asiago, Mascarpone, and Pecorino. This shows, once again, that for some products results are not very robust, and this leaves room for further investigation.

Table 4. **Private Label (PL) market shares and trends (α_{3ij}) for dairy product in Italy by retail channel (%)**

	Superettes		Super/ hypermarkets		Total Retail	
	2005	α_{3ij}	2005	α_{3ij}	2005	α_{3ij}
Asiago	18.8	2.02***	12.8	0.38**	11.2	0.76***
Butter	21.0	0.77***	24.4	1.21***	19.8	0.91***
Caciotte	0.1	– 0.10**	0.2	– 0.04**	0.1	– 0.04**
Emmenthal	7.0	0.05	7.6	– 0.10	5.8	0.00
Processed cheese (slices)	10.4	0.38*	13.4	0.36***	12.9	0.53***
Processed cheese (portions)	0.6	0.02	2.3	0.13***	1.7	0.11***
Gorgonzola	3.4	0.32*	3.0	0.06**	2.4	0.13***
UHT milk	10.6	– 0.22	15.0	– 0.16***	18.1	0.47**
Mascarpone	15.3	1.08***	18.5	1.47***	17.3	1.46***
Mozzarelle	5.3	0.45***	11.1	0.68***	8.7	0.68***
Pecorino	0.6	– 0.11	2.0	0.24***	1.4	0.12
Provolone	3.0	0.18	1.7	– 0.15***	1.5	0.06
Ricotta	3.5	0.32***	7.2	0.49***	4.9	0.38***
Stracchini	4.6	0.42*	7.4	0.56***	5.3	0.44***
Taleggio	2.6	0.22**	4.4	0.27***	2.8	0.20***
Yogurt	8.0	0.60***	9.7	0.52***	11.1	0.75***

Note: α_{3if} is recomputed as absolute change per year. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

5. Concluding remarks

In this paper, we have analysed empirically the impact of PL development on NB prices for the dairy sector in Italy. The "conventional wisdom" concerning NB manufacturers' reaction to PL development foresees a reduction in NB prices. However, some researchers have found a positive response of NB prices, providing evidences that this is partially related to the product differentiation strategies of the leading brands.

Thus, since there is no clear behavioural model explaining the NB manufacturers' response to PL introduction, we have estimated, as in similar studies, *ad hoc* models, trying to capture the relationship between NB real prices and the PL share.

Using retail sales data from *ACNielsen*, we have built time series of NB and PL market shares and prices for different dairy products, also distinguishing by retail channel (super/hypermarkets and superettes), a feature which is seldom analysed in this literature. For each product and each retail channel, we have selected the best regression model taking into account the possible presence of serial correlation, the possible endogeneity of the independent variables and the role of some structural parameters (concentration ratio and market share of modern retail).

We find that, for certain products, the impact of PL development on NB prices is negative. This is the case of highly differentiated products such as yogurt and UHT milk and of industrial products such as butter and Mascarpone. While differentiation strategy partially explains positive responses of NB prices, in the case of yogurt and UHT milk the reason of the negative impact may be due to the counter-differentiation strategies implemented by retailers on their PL products.

The NB elasticity response is positive in the case of traditional cheeses characterized by a market dominated by strong National Brands adopting differentiation strategies. This is the case of Provolone and Stracchini.

The above results are confirmed across retail formats. Other traditional cheeses, such as Asiago and Pecorino, show unstable signs across retail formats that need to be further investigated.

Given the limitations of the database we have used, the interpretation of our results should be taken with some caution, since it needs to be confirmed by further investigating the relationships between NB prices and PL development. This could be done introducing among the explanatory variables indicators of brand proliferations, both for NB and for PL, and other indicators that can capture the complexity of product differentiation strategies implemented by manufacturers and retailers. This, of course, leaves the door open for further research efforts in this area.

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APPENDIX

Table A1. **National Brand (NB) market shares (measured as *CR4*) [a] and trends (α_{3ij}) for dairy product in Italy by retail channel (%)**

Product	Superettes		Super/ hypermarkets		Total Retail	
	2005	α_{3ij}	2005	α_{3ij}	2005	α_{3ij}
Asiago	1.6	– 0.44**	1.7	– 0.26***	1.4	– 0.23***
Butter	25.8	– 0.12	24.1	– 1.26***	23.5	– 0.64***
Caciotte	17.0	0.26	21.7	1.01*	18.6	0.67
Emmenthal	29.6 [b]	2.07***	35.2 [b]	1.08**	29.3 [b]	1.48***
Processed cheese (slices)	80.1	– 0.63***	79.4	0.27***	78.6	0.06
Processed cheese (portions)	85.4	– 0.08	84.0	– 0.19	80.5	– 0.26
Gorgonzola	61.3	0.04	59.7	– 0.69***	49.8	– 0.64***
UHT milk	58.9	0.12	57.9	0.37	55.1	0.17
Mascarpone	70.2	– 0.80	66.5	– 1.13***	65.3	– 0.91***
Mozzarelle	29.6	– 1.10***	36.3	– 0.80***	27.2	– 0.84***
Pecorino	5.4	0.62***	1.8	0.04	2.4	0.14***
Provolone	75.7	1.07***	70.2	2.02***	66.9	2.27***
Ricotta	25.1	– 0.07	38.6	1.12***	29.7	0.60***
Stracchini	58.8	– 0.94***	65.1	0.01	60.8	– 0.53
Taleggio	43.5	0.31	59.0	0.16	46.8	0.21
Yogurt	67.1	– 1.08***	61.6	– 0.79***	60.1	– 0.86***

Note: α_{3ij} is recomputed as absolute change per year. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

[a] *CR2* only for Asiago;

[b] 2002.

Table A2. **Private Label (PL) prices (€/kg) and trends (α_{3ij} – %) for dairy product in Italy by retail channel** [a]

Product	Superettes		Super/ hypermarkets		Total Retail	
	2005	α_{3ij}	2005	α_{3ij}	2005	α_{3ij}
Asiago	9.39	– 0.51	8.37	– 0.86***	8.69	– 0.49**
Butter	5.76	– 2.49***	5.20	– 2.59***	5.35	– 2.67***
Caciotte	10.56	0.00	9.77	1.28*	9.96	0.05
Emmenthal	9.96	– 0.17	8.49	– 1.61***	8.87	– 1.34**
Processed cheese (slices)	5.28	– 3.09***	4.47	– 3.67***	4.16	– 4.46***
Processed cheese (portions)	6.07	– 2.17***	5.52	– 2.93***	5.63	– 2.75***
Gorgonzola	11.18	2.87***	9.47	– 1.13***	9.90	– 0.54
UHT milk	0.74	– 2.35***	0.70	– 2.35***	0.61	– 3.45***
Mascarpone	6.42	– 1.57***	5.70	– 3.13***	5.36	– 3.34***
Mozzarelle	6.71	– 2.64***	5.47	– 2.14***	5.13	– 3.12***
Pecorino	11.25	– 1.93	11.28	0.36	11.30	– 1.01
Provolone	10.81	0.34	9.44	– 1.61***	9.96	– 0.65**
Ricotta	3.79	– 1.00	2.87	– 0.99***	2.81	– 0.99**
Stracchini	8.33	– 1.15	7.50	– 1.50***	7.36	– 1.72***
Taleggio	10.02	–	8.97	– 0.32	9.22	– 0.18
Yogurt	2.84	– 2.25***	2.72	– 1.03***	2.30	– 2.65***

Note: α_{3ij} is recomputed as % variation per year. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.
[a] Prices are deflated by the CPI (2000 = 1).

Table A3. **National Brand (NB) prices (€/kg) and trends (α_{3ij} - %) for dairy product in Italy by retail channel** [a]

Product	Superettes		Super/ hypermarkets		Total Retail	
	2005	α_{3ij}	2005	α_{3ij}	2005	α_{3ij}
Asiago	9.31	– 1.41***	9.36	– 0.67	9.36	– 0.87*
Butter	7.24	– 1.33**	6.86	– 0.83	7.00	– 1.03*
Caciotte	11.32	– 0.24	10.92	– 0.31***	11.27	– 0.09
Emmenthal	9.81 [b]	– 1.66***	9.29 [b]	– 1.94***	9.46 [b]	– 1.73***
Processed cheese (slices)	6.70	– 3.86***	6.05	– 4.20***	6.14	– 4.30***
Processed cheese (portions)	8.72	– 1.67***	8.55	– 1.43***	8.68	– 1.48***
Gorgonzola	10.91	– 1.33***	10.36	– 1.88***	10.53	– 1.81***
UHT milk	1.09	– 1.71***	0.98	– 1.91***	1.03	– 1.85***
Mascarpone	7.74	– 1.47***	7.10	– 2.04***	7.49	– 1.64***
Mozzarelle	8.28	– 2.31***	7.91	– 2.25***	8.17	– 2.21***
Pecorino	13.16	3.37**	12.34	3.04***	12.84	3.55***
Provolone	11.60	– 1.39***	11.25	– 1.04***	11.49	– 1.14***
Ricotta	5.39	– 0.47	4.81	– 0.38	4.77	– 0.92***
Stracchini	9.63	– 0.89***	8.58	– 1.23***	9.25	– 0.89***
Taleggio	12.34	– 0.33	11.75	– 0.24	12.09	– 0.36**
Yogurt	4.66	– 2.16***	4.24	– 2.36***	4.37	– 2.41***

Note: α_{3ij} is recomputed as % variation per year. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.
[a] Prices are deflated by the CPI (2000 = 1);
[b] 2002.

Table A4. **Parameter estimates of the selected models for the Super/hypermarket channel in Italy**

Product	Model[a]	Parameters						
		$lnPLSH_{ijt}$	$lnCR4_{ijt}$	$lnMRSH_{ijt}$	$lnCR4_{ijt}$* $lnPLSH_{ijt}$	$lnMRSH_{ijt}$* $lnPLSH_{ijt}$	*Trend*	D_{sem}
Asiago	olsq	0.050*	–	–	–	–	– 0.36	– 0.014
Butter	olsq	1.832***	3.326***	–	2.152***	–	1.94**	0.020
Caciotte	olsq	0.015**	–	–	–	–	– 0.19**	0.004
Emmenthal	olsq	1.512**	0.839	8.015	0.468**	3.746*	1.93	0.011
Processed cheese (slices)	olsq	0.246	–	3.303**	–	1.685 **	– 2.67***	0.009
Processed cheese (portions)	ar1_inst	0.036	–	–	–	–	– 3.93	– 0.004
Gorgonzola	ar1	– 0.013	–	–	–	–	– 1.88***	0.004
UHT milk	olsq	– 0.268**	– 0.457***	–	–	–	– 1.92***	– 0.014
Mascarpone	olsq	– 0.052***	–	–	–	–	– 0.85**	0.076***
Mozzarelle	olsq	0.846	2.168*	– 1.343	0.874	– 0.109	– 2.38***	0.002
Pecorino	olsq_inst	0.899**	0.738	–	0.208**	–	1.89**	– 0.025
Provolone	olsq	0.046*	–	–	–	–	– 0.77***	– 0.005
Ricotta	ar1	0.033	–	–	–	–	– 0.90	0.029***
Stracchini	ar1	0.041**	–	–	–	–	– 1.85***	0.010**
Taleggio	ar1	– 0.014	– 0.332***	–	–	–	– 0.08	– 0.012***
Yogurt	olsq	– 0.460***	–	–	–	–	1.71	0.012

Note: Trend is recomputed as % variation per year. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

[a] Estimation method: olsq = ordinary least squares; ar1 = correction for autocorrelation of degree1; _inst = instrumental variables.

Table A5. **Parameter estimates of the selected models for the Superette channel in Italy**

Product	Model[a]	Parameters						
		$lnPLSH_{ijt}$	$lnCR4_{ijt}$	$lnMRSH_{ijt}$	$lnCR4_{ijt}$* $lnPLSH_{ijt}$	$lnMRSH_{ijt}$* $lnPLSH_{ijt}$	*Trend*	D_{sem}
Asiago	olsq	– 0.059*	–	–	–	–	0.04	– 0.006
Butter	olsq	– 3.401***	–	– 31.265***	–	– 15.998***	1.64*	– 0.028
Caciotte	olsq	0.006	0.056***	–	–	–	0.07	0.017*
Emmenthal	olsq	– 0.069*	– 0.159***	0.591*	–	–	– 1.37*	0.011
Processed cheese (slices)	ar1	– 0.091**	–	–	–	–	– 3.30***	0.009*
Processed cheese (portions)	ar1	0.040**	–	–	–	–	– 2.20***	0.001
Gorgonzola	ar1	0.002	–	–	–	–	– 1.44***	– 0.001
UHT milk	olsq	– 0.074	–	–	–	–	– 1.80***	– 0.019
Mascarpone	olsq	0.579***	3.136**	3.726**	1.192**	1.152**	– 2.07***	0.060**
Mozzarelle	olsq	– 0.160*	–	– 1.675*	–	– 0.429**	– 2.49***	– 0.002
Pecorino	olsq	– 0.289***	– 0.252***	–	– 0.059**	–	1.29*	– 0.043**
Provolone	ar1	0.005	–	–	–	–	– 1.43***	– 0.003
Ricotta	olsq	0.178***	–	2.589***	–	0.338***	– 2.38***	– 0.005
Stracchini	olsq	0.010***	–	0.529***	–	–	– 1.96***	0.012*
Taleggio	olsq	0.008**	–	0.342***	–	–	– 0.96***	– 0.003
Yogurt	olsq	– 0.235***	–	–	–	–	1.35**	0.004

Note: Trend is recomputed as % variation per year. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

[a] Estimation method: olsq = ordinary least squares; ar1 = correction for autocorrelation of degree1.