

Do consumers benefit from private label development?

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Abstract. *In the European food sector private labels represent a relevant and increasing share of total sales. Thus, national brands need to adapt their marketing strategies to deal with this growing competition. 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 food retail sector, which is of special research interest, since it has undergone a dramatic change in the last 10 years. Using retail sales data, we build time series of market shares of prices of national brands and private labels for different dairy products and we study how prices of national brands react to private label growth. We find that, for most products, the negative impact of private label development on national brand prices is confirmed, and this may be mainly due to the difficulties in implementing product differentiation strategies by national brand manufacturers. A relevant exception is the hard discount channel, probably because its success is attracting an increasing number of national brands.*

KeyWords: private label, pricing, retail sector, dairy products.

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.

Their introduction in EU supermarkets goes back to the late '70s, when PL products were viewed as a cheap and generic substitute for National Brand (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 typically 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.

The reasons that make PL products strategically interesting for retailers are well known: since their brand often 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.

The economics of PL products has received relatively little attention by researchers: a recent paper by Berges-Sennou et al. (2004) surveys this literature, which 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; Mills, 1999; Bontems et al., 1999; Gabrielsen and Sorgard, 2006).

Since, after the introduction phase, PL 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 analyse 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) reviews 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 the 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 (2006) 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.

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 is 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.

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%. The share of modern retail chains in total food sales is around 60%, even 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 type 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 1994-2004, distinguished by type of brand (NB vs. PL) and by retail channel (super/hypermarkets, superettes, hard discounts). 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 5 we present our results, while in section 6 we draw some conclusions.

2. Estimated model

As in similar papers discussed in the previous section, this paper adopts reduced-form 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:

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

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 and $trend$ is a linear time trend.

Compared with the above papers, the most relevant feature of model (1) is that we estimated different parameters/elasticities for different retail channels (super/hypermarkets, superettes, hard discounts). The rationale for doing this stems from the fact that both NB products and PL products sold in super/hypermarkets tend to be strongly different from those sold in hard discounts. This is the rule for those retailers that are specialised in one of the above retail channels (i.e. specialised hard discounters), but it is also true for large multi-channel retailers, that manage shops in more than one retail channels. In fact, following the logic of NB manufacturers, that tend to produce different versions of their product to be sold in different channels (the highest quality in super/hypermarkets, the lowest quality in hard discounts), most large retailers offer different PL products in different channels. Thus, this product differentiation strategies may be relevant to determine the NB response to PL development. In any case, in order to compare our results with those of previous studies, model (1) has been estimated also for the total market of each product.

Since the NB price dynamics 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. The two variables that are available in our database are the (log) measures of the concentration ratio in the manufacturing sector for each product ($CR4_{ijt}$) and the share of modern retailers in each market (MRS_{ijt}); these variables can be considered as proxies of market power by manufacturers and retailers respectively. Other phenomena 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 4 leading brands¹, of PL products and of other brands. Thus, nominal NB prices are approximated by the value of sales of the 4 leading brands divided by the corresponding quantity, and they are converted in real prices using the Consumer Price Index 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 11 years (1994-2004) for most products² and is organised by semester. Thus, for most product categories, we have 22 observations to be used in our regression models.

For each product category and for each retail channel, model (1) has been 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. For each estimated model we test for serial correlation and, when present, we correct it using exact maximum likelihood estimation³. Moreover, since the PL market share may be endogenous, for each selected model (OLS or exact maximum likelihood, depending on the test for serial correlation) we also estimate the corresponding instrumental variable (IV) version. In order to select between the standard version or the IV version, we perform the Hausman test for endogeneity⁴. Finally, in order to select the best model among the different estimated versions (standard or augmented), we consider the AIC and BIC criteria and the significance of the estimated coefficients.

4. Results and discussion

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.

The market share of PL is still quite low for many Italian dairy products. Butter reaches the highest share (19.8% in 2004), but only three other products display a double-digit value (UHT milk, Mascarpone and Asiago). The case of Asiago is especially interesting, since it is the only PDO cheese showing a relevant PL share (11.1% in 2004), while for the others (Gorgonzola, Pecorino, Provolone, Taleggio) the PL share ranges from 2 to 5%.

In general, trend coefficients are positive for virtually all products and reach very high values for products like Asiago, Butter, and Mascarpone, where the yearly rate of change of the market share is around 1%. Hence, there is a clear strong development of PL products in the Italian dairy market.

The market share of NB (computed as CR4) 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 yoghurt, but also for a PDO cheese like Provolone, which is typically produced by a few large firms located in the North of the country. Trend coefficients are rather mixed, such that we cannot define a clear common dynamics for the structure of the dairy sector in the observed period.

Prices for PL and NB are expressed in euro/Kg and are deflated by the CPI (2000 = 1). Excluding Pecorino, NB prices are always higher than the corresponding PL ones. Again excluding Pecorino, significant trend coefficients are negative for both PL and NB prices, thus showing a general declining trend in real dairy prices. Why does this happen? Different possible answers may be hypothesized: the growth of modern retail share, the decrease of raw milk price due to the reforms of the EU common

¹ For the Asiago case, there are only 2 leading brands, since all the other firms have a very low market share.

² For Pecorino the time series starts in 1995 and for Asiago in 1996.

³ 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.

⁴ In each equation, we use as instruments the lagged dependent and independent variables (including the trend) and the constant term.

agricultural policy, 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.

Tables A1-A3 in the Appendix show the same type of data and results displayed in Table 1, distinguished by retail channel. The PL share is generally lower in hard discounts and this is true also for the NB share. Moreover, the declining price trend is confirmed for superettes and super/hypermarkets, while hard discounts show a mixed pattern.

Table 2 provides the key results of our analysis, where the impact of PL development on NB dairy prices in Italy is described through the estimated elasticities. Results are distinguished by retail channel⁵ and each of the reported elasticities is taken from the model selected with the criteria described in the previous section.

At first, we find important differences among the retail channels. In hard discounts, the significant elasticities are all positive, while in superettes and super/hypermarkets most significant elasticities are negative. As reviewed in our introduction, the “conventional wisdom” concerning NB manufacturers’ reaction to PL development foresees a reduction in NB prices (which seems confirmed by our results in superettes and super/hypermarkets). However, some researchers have found a positive response of NB prices, providing evidences that this is mainly 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.

In general, we can claim that, for most dairy products analysed in this paper, strong product differentiation strategies are quite difficult to implement. Of course, it is always possible to invest in advertising in order to increase brand loyalty, but producing new varieties of these products remains very difficult. This is especially true for PDO cheeses (Asiago, Gorgonzola, Pecorino, Provolone, Taleggio), which have to follow their official Product Specifications, but also for other traditional non-PDO Italian cheeses (Caciotte, Mascarpone, Mozzarella, Ricotta, Stracchini) or for some standardised industrial products (butter, processed cheese). Thus, for these products, the prevailing negative elasticities may be related to the fact that the room for product differentiation strategies by NB manufacturers is quite small and it does not allow to charge a premium price for differentiated products. Thus, when the PL share increases, we expect a declining trend in real NB prices.

However, this reasoning cannot be applied to products like UHT milk or yogurt, for which product differentiation is very strong. Thus, how can we justify the negative elasticities that we obtain also for these two products? One possible explanation may be based on the PL product differentiation strategies implemented by retailers. In fact, for both UHT milk and yogurt, retailers have reacted to the NB manufacturers’ product differentiation strategies implementing analogous strategies within their PL products. Thus, it is becoming increasingly common to find a PL alternative for each version of UHT milk or 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. Of course, this interpretation opens to further empirical analysis, including brand proliferation indicators (for both NB and PL) as explanatory variables of the change in NB prices.

A further point concerns the positive elasticities we have obtained in hard discount for virtually all products, that may be justified on a totally different ground. In fact, in the last 3-4 years, the general economic stagnation experienced by Italy has boosted the market share of hard discounts for many food products, including dairy (the average share in 2004 was around 6% for the dairy sector as a whole). Given its increasing popularity, the low-price retail channel has become increasingly interesting for many NB producers. Thus, while the PL share was increasing, the average quality of NB products sold in hard discount was also increasing, not because of channel-specific product differentiation strategies, but

⁵ For some products, results for hard discounts are not available because of the limited number of available observations.

because new NB manufacturers were entering in the low-price outlets. This higher average quality may be the cause of the observed increasing price trend. Once again, this interpretation should be verified through the use of NB brand proliferation indicators as explanatory variables.

Finally, tables A4-A5 in the Appendix show the elasticities of NB prices with respect to the structural parameters (concentration ratio and modern retail share) for those cases in which these variables are included in the selected models. For both variables we cannot detect a common pattern for interpreting their effects.

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 mainly 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, reduced-form 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, distinguishing by retail channel (super/hypermarkets, superettes, hard discounts). For each product and each retail channel, we 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 most products, the negative impact of PL development on NB prices is confirmed. For many Italian dairy products, typically PDO and traditional cheeses, this may be due to the difficulties in implementing product differentiation strategies by national brand manufacturers. For some other products, like UHT milk or yogurt, the reason of this negative impact on prices may be due to the counter-differentiation strategies implemented by retailers on their PL products. A relevant exception is the hard discount channel, for which we find a positive relationship between NB prices and PL shares, probably because its success is attracting an increasing number of national brands, which raises the average quality and prices of NB sold in the low-price outlets.

Of course, these interpretations of our results should be confirmed by further investigating the relationships between NB prices and PL development, typically 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.

Table 1. Market shares and average prices (€/Kg) for Private Label (PL) and National Brands (NB) and their respective trends by semester (α_{3ij}) for the period 1994-2004

| | Market share PL | | Market share NB | | Price PL | | Price NB | |
|-----------------------------|--------------------|----------------|--------------------|----------------|----------|------------------------------|----------|------------------------------|
| | 2004 | α_{3ij} | 2004 | α_{3ij} | Mean | $\alpha_{3ij} / \text{mean}$ | Mean | $\alpha_{3ij} / \text{mean}$ |
| Asiago | 0.111 | 4.156*** | 0.013 | -1.417*** | 7.94 | -2.328** | 8.26 | -5.925** |
| Butter | 0.198 | 4.663*** | 0.259 | -1.852*** | 5.49 | -10.114*** | 7.11 | -0.764 |
| Caciotte | 0.002 | -0.216** | 0.177 | 3.635 | 8.18 | 2.111 | 9.75 | -0.333 |
| Emmenthal | 0.068 | 0.395 | 0.293 ^a | 7.389*** | 8.20 | -4.265* | 9.02 | -8.704*** |
| Processed cheese (slices) | 0.107 | 1.935*** | 0.790 | 0.269 | 5.17 | -16.433*** | 6.70 | -21.438*** |
| Processed cheese (portions) | 0.020 | 0.648*** | 0.795 | -1.423 | 5.71 | -15.742*** | 8.73 | -5.681*** |
| Gorgonzola | 0.022 | 0.809*** | 0.466 | -4.696*** | 9.15 | 0.086 | 10.26 | -7.984*** |
| UHT milk | 0.128 | 0.313 | 0.506 | -0.479 | 0.71 | -11.596*** | 0.99 | -9.878*** |
| Mascarpone | 0.133 | 5.798*** | 0.599 | -8.340*** | 5.86 | -13.881*** | 7.32 | -6.201*** |
| Mozzarella | 0.060 | 2.276*** | 0.272 | -4.723*** | 5.87 | -8.860** | 8.39 | -9.288*** |
| Pecorino | 0.032 | 2.334*** | 0.018 | 0.257 | 11.78 | 11.199** | 9.81 | 8.835*** |
| Provolone | 0.034 | 1.076*** | 0.694 | 13.365*** | 9.28 | -1.679** | 10.64 | -5.271*** |
| Ricotta | 0.037 | 1.588*** | 0.274 | 2.954*** | 2.89 | -0.322 | 4.36 | -4.759** |
| Stracchini | 0.056 | 2.455*** | 0.628 | -2.442 | 7.14 | -6.409** | 8.69 | -2.900** |
| Taleggio | 0.030 | 1.125*** | 0.491 | 2.441*** | 7.93 | -0.637 | 10.70 | -1.681* |
| Yogurt | 0.074 ^b | 2.963*** | 0.663 ^b | -4.291*** | 2.52 | -5.895*** | 4.02 | -13.058*** |

Note: α_{3ij} is given in % and is by semester. ***, **, and * indicate significance at the 1%, 5%, and 10% levels. Prices are deflated by the CPI. Market shares of NB is measured as a CR₄ (CR₂ only for Asiago).
^a 2002; ^b 2003.

Table 2. Elasticity of NB price with respect to PL share for 16 categories of dairy products in Italy distinguished by retail channel (average 1994 – 2004)

| | Hard Discount | Superettes | Super/ hypermarkets | Total Retail |
|-----------------------------|---------------|------------|------------------------|--------------|
| Asiago | - | -0.022 | 0.048 | 0.221*** |
| Butter | 0.133*** | -0.435*** | -0.547*** | -0.559*** |
| Caciotte | - | 0.008 | 0.015** | 0.018*** |
| Emmenthal | 0.005 | -0.069* | -0.095*** | -0.067*** |
| Processed cheese (slices) | 0.096* | -0.101** | -0.182*** | -0.185** |
| Processed cheese (portions) | - | -0.069** | 0.026 | -0.030 |
| Gorgonzola | 0.025 | 0.001 | -0.020 | -0.039*** |
| UHT milk | -0.084 | -0.324** | -0.392*** | -0.360** |
| Mascarpone | 0.114* | -0.007 | -0.043*** | -0.040** |
| Mozzarella | 0.042* | 0.033*** | -0.054 | 0.036 |
| Pecorino | - | -0.143 | -0.059 | -0.034 |
| Provolone | 0.030** | 0.083 | -0.007 | 0.028 |
| Ricotta | 0.105* | -0.004 | -0.345 | -0.008 |
| Stracchini | - | 0.011*** | 0.009 | 0.024*** |
| Taleggio | - | 0.008** | -0.022 | 0.016 |
| Yogurt | -0.021 | -0.207*** | -0.411*** | -0.382*** |

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

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Appendix

Table A1. Market shares and prices (€/Kg) for Private Label (PL) and National Brands (NB) and their respective trends by semester (α_{3ij}) for the period 1994-2004 in the Hard Discount channel

| Product | Hard Discounts | | | | | | | |
|-----------------------------|--------------------|----------------|--------------------|----------------|----------|-----------------------|----------|-----------------------|
| | Market share PL | | Market share NB | | Price PL | | Price NB | |
| | 2004 | α_{3ij} | 2004 | α_{3ij} | Mean | $\alpha_{3ij} / mean$ | Mean | $\alpha_{3ij} / mean$ |
| Asiago | 0.015 | 0.749*** | 0.000 | -0.113 | 7.74 | | 7.04 | -14.627** |
| Butter | 0.017 | 0.581 | 0.050 | 2.598* | 5.22 | 13.751 | 6.22 | 11.444 |
| Caciotte | 0.000 | -0.036 | 0.009 | -0.014 | 5.77 | | 8.55 | -5.987* |
| Emmenthal | 0.009 | 0.307 | 0.077 ^a | 5.325*** | 7.24 | 24.514*** | 8.03 | -5.027 |
| Processed cheese (slices) | 0.007 | 0.394 | 0.579 | 34.309*** | 4.79 | 10.712 | 5.01 | -26.696** |
| Processed cheese (portions) | 0.000 | | 0.119 | 5.534 | 5.17 | 5.698 | 6.70 | 5.698 |
| Gorgonzola | 0.000 | -0.013 | 0.112 | 4.928 | 9.37 | -0.645 | 7.89 | -11.146* |
| UHT milk | 0.013 | 0.480* | 0.046 | 0.743 | 0.58 | -20.857 | 0.80 | 12.304** |
| Mascarpone | 0.011 | 0.667** | 0.072 | 3.727 | 5.50 | 30.393*** | 6.99 | 10.297** |
| Mozzarella | 0.001 | 0.061 | 0.041 | 1.895*** | 6.16 | 5.467 | 7.89 | -3.016 |
| Pecorino | 0.002 | 0.153*** | 0.000 | -0.137 | 13.96 | | 11.88 | 36.637*** |
| Provolone | 0.004 | 0.023 | 0.290 | 11.851** | 8.82 | 2.986* | 8.73 | 5.859 |
| Ricotta | 0.001 | 0.076 | 0.204 | 12.181** | 3.48 | -7.041* | 3.63 | -30.703* |
| Stracchini | 0.001 | 0.163 | 0.140 | 6.012*** | 7.34 | | 9.04 | 18.913*** |
| Taleggio | 0.007 | 0.352* | 0.111 | 5.117*** | 7.64 | | 10.85 | -3.341 |
| Yogurt | 0.007 ^b | -0.098 | 0.114 ^b | 7.525* | 2.05 | -2.743 | 3.51 | 4.100 |

Note: α_{3ij} is given in ‰ and is by semester. ***, **, and * indicate significance at the 1%, 5%, and 10% levels. Prices are deflated by the CPI. Market shares of NB is measured as a CR₄ (CR₂ only for Asiago).
^a 2002; ^b 2003.

Table A2. Market shares and prices (€/Kg) for Private Label (PL) and National Brands (NB) and their respective trends by semester (α_{3ij}) for the period 1994-2004 in the Superette channel

| Product | Superette | | | | | | | |
|-----------------------------|--------------------|----------------|--------------------|----------------|----------|-----------------------|----------|-----------------------|
| | Market share PL | | Market share NB | | Price PL | | Price NB | |
| | 2004 | α_{3ij} | 2004 | α_{3ij} | Mean | $\alpha_{3ij} / mean$ | Mean | $\alpha_{3ij} / mean$ |
| Asiago | 0.212 | 14.184*** | 0.014 | -2.822** | 8.35 | -3.661 | 8.18 | -11.111*** |
| Butter | 0.256 | 6.129*** | 0.287 | 0.152 | 5.63 | -10.091*** | 7.50 | -0.764 |
| Caciotte | 0.001 | -0.591** | 0.145 | 1.231 | 9.28 | 0.574 | 9.67 | -0.813*** |
| Emmenthal | 0.119 | 2.256 | 0.296 ^a | 10.275*** | 8.29 | -0.322 | 9.27 | -8.311*** |
| Processed cheese (slices) | 0.121 | 2.983*** | 0.801 | -3.532*** | 5.54 | -14.987*** | 7.00 | -19.895*** |
| Processed cheese (portions) | 0.021 | 0.868*** | 0.849 | -0.350 | 5.79 | -14.110*** | 8.84 | -7.015*** |
| Gorgonzola | 0.030 | 1.959** | 0.567 | -1.236 | 9.38 | 19.412*** | 10.45 | -5.553*** |
| UHT milk | 0.156 | 0.877** | 0.556 | 0.220 | 0.73 | -12.505*** | 1.04 | -8.916*** |
| Mascarpone | 0.159 | 6.241*** | 0.651 | -6.829** | 6.04 | -7.825*** | 7.59 | -5.672*** |
| Mozzarella | 0.065 | 3.012*** | 0.292 | -6.490*** | 6.62 | -13.532*** | 8.58 | -9.966*** |
| Pecorino | 0.084 | 6.419*** | 0.004 | -0.932* | 12.25 | 7.764* | 9.83 | 6.613 |
| Provolone | 0.101 | 4.142*** | 0.746 | 5.971*** | 9.56 | 3.521 | 10.97 | -6.103*** |
| Ricotta | 0.040 | 2.043*** | 0.254 | 1.000 | 3.46 | -4.952 | 4.47 | -4.563*** |
| Stracchini | 0.061 | 3.248*** | 0.632 | -4.315*** | 7.44 | -6.126 | 8.94 | -4.083** |
| Taleggio | 0.030 | 1.479*** | 0.473 | 3.464 | 7.66 | | 11.00 | -1.260 |
| Yogurt | 0.087 ^b | 3.649*** | 0.694 ^b | -7.728*** | 2.62 | -13.708*** | 4.15 | -14.510*** |

Note: α_{3ij} is given in ‰ and is by semester. ***, **, and * indicate significance at the 1%, 5%, and 10% levels. Prices are deflated by the CPI. Market shares of NB is measured as a CR₄ (CR₂ only for Asiago).
^a 2002; ^b 2003.

Table A3. Market shares and prices (€/Kg) for Private Label (PL) and National Brands (NB) and their respective trends by semester (α_{3ij}) for the period 1994-2004 in the Supermarket/hypermarket channel

| | Supermarket/hypermarket | | | | | | | |
|-----------------------------|-------------------------|----------------|--------------------|----------------|----------|------------------------------|----------|------------------------------|
| | Market share PL | | Market share NB | | Price PL | | Price NB | |
| | 2004 | α_{3ij} | 2004 | α_{3ij} | Mean | $\alpha_{3ij} / \text{mean}$ | Mean | $\alpha_{3ij} / \text{mean}$ |
| Asiago | 0.114 | 1.111 | 0.014 | -1.667*** | 7.74 | -4.653*** | 8.25 | -4.262 |
| Butter | 0.236 | 5.722*** | 0.269 | -3.938*** | 5.38 | -9.716*** | 6.86 | -0.562 |
| Caciotte | 0.004 | -0.178* | 0.212 | 5.698* | 7.98 | 8.118** | 9.55 | -1.591*** |
| Emmenthal | 0.070 | -0.744 | 0.352 ^a | 5.366** | 8.21 | -6.044*** | 8.93 | -9.762*** |
| Processed cheese (slices) | 0.134 | 1.748*** | 0.784 | 1.703*** | 5.00 | -15.728*** | 6.39 | -21.632*** |
| Processed cheese (portions) | 0.027 | 0.630** | 0.827 | -0.806 | 5.66 | -14.545*** | 8.48 | -5.560*** |
| Gorgonzola | 0.027 | 0.265 | 0.561 | -4.696*** | 8.90 | -4.089*** | 10.06 | -8.683*** |
| UHT milk | 0.156 | -0.832*** | 0.530 | 0.339 | 0.70 | -10.648*** | 0.95 | -10.385*** |
| Mascarpone | 0.166 | 7.225*** | 0.584 | -10.515*** | 5.76 | | 7.01 | -9.042*** |
| Mozzarelle | 0.098 | 3.157*** | 0.360 | -4.532*** | 5.64 | -8.269** | 8.12 | -9.287*** |
| Pecorino | 0.020 | 1.142*** | 0.032 | 1.319*** | 11.09 | 11.788* | 9.93 | 11.841*** |
| Provolone | 0.028 | -0.600*** | 0.753 | 12.614*** | 8.92 | -7.965*** | 10.50 | -4.371*** |
| Ricotta | 0.066 | 2.332*** | 0.349 | 4.690*** | 2.76 | -3.387** | 4.16 | -2.332 |
| Stracchini | 0.081 | 3.231*** | 0.663 | 0.073 | 7.06 | -7.062*** | 8.23 | -4.008*** |
| Taleggio | 0.047 | 1.534*** | 0.562 | -0.023 | 7.96 | -0.945 | 10.40 | -0.992 |
| Yogurt | 0.080 ^b | 2.742*** | 0.677 ^b | -3.476*** | 2.51 | -3.795** | 3.90 | -11.616*** |

Note: α_{3ij} is given in ‰ and is by semester. ***, **, and * indicate significance at the 1%, 5%, and 10% levels. Prices are deflated by the CPI. Market shares of NB is measured as a CR₄ (CR₂ only for Asiago).
^a 2002; ^b 2003.

Table A4. Elasticity of NB prices with respect to CR_n for the selected models of table 2

| | Hard Discount | Superettes | Super/ hypermarkets | Total Retail |
|-----------------------------|---------------|------------|------------------------|--------------|
| Asiago | | | | 0.083 |
| Butter | | | | |
| Caciotte | | 0.059*** | | 0.062*** |
| Emmenthal | | -0.159*** | -0.161*** | -0.171*** |
| Processed cheese (slices) | -0.435*** | | | |
| Processed cheese (portions) | | | 0.840*** | |
| Gorgonzola | 0.215* | | | 0.124* |
| UHT milk | | | -0.386*** | -0.274 |
| Mascarpone | | | | |
| Mozzarelle | | | | |
| Pecorino | | | | |
| Provolone | 0.100** | 0.144 | | |
| Ricotta | | | 1.657 | 0.263*** |
| Stracchini | | | | |
| Taleggio | | | -0.304** | |
| Yogurt | | | | 0.498* |

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels. Missing values indicate that the variable is not included in the selected model presented in table 2.

Table A5. Elasticity of NB prices with respect to Modern Retail share for the selected models of table 2

| | Hard Discount | Superettes | Super/ hypermarkets | Total Retail |
|-----------------------------|---------------|------------|------------------------|--------------|
| Asiago | | | | 1.299* |
| Butter | | 0.996** | | |
| Caciotte | | | | |
| Emmenthal | 7.588** | 0.591* | | |
| Processed cheese (slices) | 6.569** | | -0.803** | |
| Processed cheese (portions) | | | | |
| Gorgonzola | | | | |
| UHT milk | | | | -0.283* |
| Mascarpone | | | -0.314* | |
| Mozzarella | | | | |
| Pecorino | | | | |
| Provolone | 1.949*** | 0.874 | | |
| Ricotta | | | | |
| Stracchini | | 0.533*** | | 0.169 |
| Taleggio | | 0.348*** | | |
| Yogurt | | | | |

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels. Missing values indicate that the variable is not included in the selected model presented in table 2.