Organic label and profits sharing in the French fluid milk market

Céline Bonnet¹, Zohra Bouamra-Mechemache²

¹ Toulouse School of Economics (Gremaq, INRA), Celine.Bonnet@toulouse.inra.fr
² Toulouse School of Economics (Gremaq, INRA), Zohra.Bouamra@toulouse.inra.fr

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Abstract

The market for organic products increases continuously over time. Because consumers are willing to pay a premium for organic goods, firms may have an interest in developing organic production strategies and entering a profitable market segment. The objective of this paper is to assess the profitability of such a strategy and to determine how the value added created by the existence of an organic label is shared in a vertical chain among manufacturers and retailers. Using purchase data on the French fluid milk sector, we develop a structural econometric model of demand and supply that takes into account the relative bargaining power between manufacturers and retailers. Our results suggest that the organic label segment is more profitable as it permits the existence of higher margins. Moreover, an organic label allows manufacturers to achieve more bargaining power relative to retailers and hence to obtain a higher share of total margins.

Key words: fluid milk market, bargaining power, organic, environmental policy, manufacturers, retailers, structural econometrics

1 Introduction

The market for organic product has continuously increased over time in the US as well as in many European countries. Actually, organic food can be used as a device toward sustainable food supply. It seems that consumers are willing to pay more for organic milk (Kiesel and Villa-Boas, 2007). For instance, Dhar and Foltz (2005) found a more significant consumer valuation for organic milk on US fluid milk data. However, the willingness to pay for organic product is quite heterogenous (Griffith and Nesheim, 2008). Moreover, consumer willingness to pay for organic is mainly explained by health and environmental motives but also by consumers’ sociodemographics and social features. However, some studies suggest that consumers are unwilling to pay a price premium for organic product but that organic products are associated with higher prosocial benefits (cf. the experimental analysis in Germany conducted by (van Doorn and Verhoef, 2011). They do not find
any correlation between willingness to pay and health perceptions. Finally they show that younger people and women value more the quality of organic product.

Even if organic products were traditionally sold by specialty shops, conventional retailers has contributed to the expansion of organic markets first through the listing of organic products in their stores and second by offering organic products under their own retail brand. If consumers’ willingness to pay for organic product is well documented, the strategic incentives of food chain to develop such products are less documented. Both large firms and retailers may have incentive to produce/sell organic products as they can earn higher margins compared to conventional products. For instance, retail margins are in average 25% higher for organic food products sold in a large retail chain in the northeastern United States (Bezawada and Pauwels, 2013).

In this paper, we focus on both firms and retailers’ incentives to sell organic labeled food products. Incentives to develop such sustainable products for firms but also for retailers (organic products sold under private retail labels) will depend on their profitability and the share of the total margin they can get from their sales. Product differentiation through labeling may lead to a positive total margin, which will benefit to the whole supply chain. However, depending on the relative market power of retailers compared to firms, higher prices may not benefit to upstream firms. It may benefit retailers that can use their buying power linked to the existence of a large and powerful retail sector (Inderst and Mazzarotto, 2008) and the development of their own private labels (Bergs-Sennou, 2006). On the other hand, when offering organic products, firms may benefit from labeling their products because this could help them in increasing their bargaining power with respect to retailers.

In this paper, we develop an empirical analysis to assess if organic label helps firms to increase their bargaining power with respect to retailers and hence, whether firms or retailers benefit more from offering organic products (by increasing their margin). Because the food retailing sector is characterized by the importance of retailers’ store brands, we will also examine if the impact of organic labels differs between national and store brands.

The empirical analysis is applied to the French fluid milk market. The global sales of this sector decreased by 10% in the last decade. However, the consumption of organic fluid milk has doubled during the last decade although it remains small. The market share of organic milk sales represented 3.5% in 2001 and reached 7.5% in 2009. This food sector is relevant for the analysis of organic supply chain for two main reasons. First, milk and dairy products represent 15% of the total French market of organic products, just behind fruit and vegetables with a market share of 17% (Source: Agence Bio, France). More generally, dairy products and more particularly fluid milk is one of the most important organic food product market in the world (along with fresh products). Second, fluid milk is one of the main organic food product listed in conventional retailers (with eggs) and more than 80% of the sales of fluid milk (in value) occur in conventional stores (source: Agence Bio, France).

Taking into account the substitutability patterns between brands, we get estimates of the total margin for each brand including organic and non organic brands. Moreover, we estimate the bargaining power between each retailer/manufacturer pair when negotiating the wholesale price of a given brand and decompose the total margin into the margin for
firms and the margin for retailers.

The paper is organized as follows. We first present the data in section 2. In section 3, we describe the econometric structural model and results are discussed in section 4. Finally, section 5 gives the main conclusions of the paper.

2 Data on fluid milk purchases

We use the 2009 data from a French representative consumer panel data of 21,605 households collected by KANTAR. It is a home-scan data set providing detailed information on all the purchases of food products. This data set provides characteristics of the good purchases (brand, size, organic label product), the store where it was purchased, the quantity purchased as well as its price. The database is composed of 322,755 purchases of fluid milk products. According to our sample, the average household consumption of conventional fluid milk is 72 liters per person per year and 6 liters of organic fluid milk.

We define the fluid milk market as the relevant market in this study. In the data at stake, Lactalis and Sodiaal that are the two main manufacturers on this market represent 28% of purchases on average over the 13 periods considered in 2009 while the market share of private labels is around 52%. We consider the two main brands produced by Lactalis (Lactel and Bridel) and the main brand for Sodiaal (Candia). Moreover, when organic milk is produced under a national brand (NB), we distinguish among the conventional milk brand and the organic milk one. Similarly we consider two private labels (PL) that differ by the organic/conventional characteristic. We consider that retailers do not vertically integrate the manufacturing firms for the production of their private labels but that their purchases of fluid milk occur through contracting with some private firms. In our dataset, we do not have any information on the identity of the manufacturer that provides the product sold under the label of the retailer. We thus assume that each retailer negotiates with one manufacturer for both conventional and organic products sold under its private label and that retailers deal with different firms. Other firms’ brands represent only a small market share. Purchases of these other firms’ NB are aggregated in an outside option good that represents 19% of the market. This outside option also includes soya milk. Consumers can thus substitute one of the NB or PL fluid milk brands with an alternative product.

Retailers are grocery store chains that differ by their size and the services they provide. Five main retailers operate in the French retail sector. Among them, three retailers are characterized by large outlets while the other ones have intermediate size outlets. In addition, we define two aggregates: an aggregate of discounters and an aggregate of the remaining retailers. Taking into account the set of products carried by each retailer we obtain 46 differentiated products that compete on the market.1

Organic products represent less than 8% of the fluid milk purchases. However, their market shares have increased in time during the last ten years. Organic production has been multiplied by five between 1998 and 2009 and consumption has increased by 21% in 1

1From the consumer perspective, a product is the combination of a brand and a retailer.
value between 2008 and 2009. Their average price exceeds the average price of conventional brands by 55% and this price difference is larger for NBs than for PLs. These numbers are in line with the observed price premium observed in the United States with a premium of 60% for NBs and 75% for PLs in the late 1990’s (Glaser and Thompson, 2000). We can also note from our data that PLs are approximately 20% cheaper than NBs.

3 Models and methods

3.1 The Demand Model: a random coefficients logit model

We use a random coefficients logit model to estimate the demand and the related price elasticities. The indirect utility function $V_{ijt}$ for consumer $i$ buying product $j$ in period $t$ is given by

$$V_{ijt} = \beta_{b(j)} + \beta_{r(j)} + \alpha_i p_{jt} + \rho_i l_j + \varepsilon_{ijt}$$

where $\beta_{b(j)}$ and $\beta_{r(j)}$ are respectively brand and retailer fixed effects that capture the (time invariant) unobserved brand and retailer characteristics, $p_{jt}$ is the price of product $j$ in period $t$, $\alpha_i$ is the marginal disutility of the price for consumer $i$, $l_j$ is a dummy related to an observed product characteristic (which takes the value of 1 if product $j$ is an organic label product and 0 otherwise), $\rho_i$ captures consumer $i$’s taste for the organic label and $\varepsilon_{ijt}$ is an unobserved error term.

We assume that $\alpha_i$ and $\rho_i$ vary across consumers. Indeed, consumers can have a different price disutility or different tastes for the organic characteristic. We assume that distributions of $\alpha_i$ and $\rho_i$ are independent and that the parameters have the following specification:

$$\left( \begin{array}{c} \alpha_i \\ \rho_i \end{array} \right) = \left( \begin{array}{c} \alpha \\ \rho \end{array} \right) + \Sigma v_i$$

where $v_i = (v_i^\alpha, v_i^\rho)'$ is a 2x1 vector that captures the unobserved consumers characteristics. $\Sigma$ is a $2 \times 2$ diagonal matrix of parameters $\sigma_\alpha, \sigma_\rho$ that measures the unobserved heterogeneity of consumers. We assume a parametric distribution for $v_i$ denoted by $P_v(.)$ and $P_v$ is independently and normally distributed with means of $\alpha, \rho$ and standard deviations of $\sigma_\alpha, \sigma_\rho$.

We can then break down the indirect utility into a mean utility $\delta_{jt} = \beta_{b(j)} + \beta_{r(j)} + \alpha p_{jt} + \rho l_j + \xi_{jt}$ where $\xi_{jt}$ captures all unobserved product characteristics and a deviation from this mean utility $\mu_{ijt} = [p_{jt}, l_j] (\sigma_\alpha v_i^\alpha, \sigma_\rho v_i^\rho)'$. The indirect utility is given by $V_{ijt} = \delta_{jt} + \mu_{ijt} + \varepsilon_{ijt}$.

We introduce an outside option that permits substitution between the considered products and a substitute. The utility of the outside good is normalized to zero. The indirect utility of choosing the outside good is $V_{i0t} = \varepsilon_{i0t}$. 


3.2 Supply models: vertical relationships between processors and retailers

We consider the fluid milk vertical channel as a two-tier industry consisting of \( n_f \) upstream firms and \( n_r \) downstream retailers. Each upstream firm produces a set of goods \( G_f \) and each downstream firm sells \( R^r \) products. We consider the market is composed of \( J \) differentiated products where a product is a brand sold in a retailer. The marginal cost of producing a product \( j \) is denoted by \( \mu_j \) while the marginal cost at the retail level is denoted \( c_j \). We note \( p_j \) the retail price of the product \( j \) and \( w_j \) its wholesale price. Retailers’ profit functions are given by:

\[
\Pi^r(p) = \sum_{j \in R^r} (p_j - w_j - c_j) M s_j(p) \quad (1)
\]

where the subscript \( t \) is omitted to simplify the notation and \( M \) is the total market size.

The profit of the firm \( f \) from all products sold to retailers is denoted by \( \Pi^f \) :

\[
\Pi^f = \sum_{j \in G_f} (w_j - \mu_j) M s_j(p). \quad (2)
\]

As in Draganska et al. (2010), we consider that firms play a two-stage Nash bargaining game. In the first stage, each pair of firms and retailers secretly and simultaneously contracts over the wholesale price of the product \( j \). In the second stage, retailers compete with each other on the final fluid milk market and set prices for each product. The game is solved by backward induction.

In the second stage, each retailer \( r \) maximizes his profit \( \Pi^r(p) \). The subgame Nash equilibrium prices of products sold by the retailer \( r \) can thus be derived from the first order conditions of retailer’ maximization program:

\[
s_k(p) + \sum_{j \in R^r} (p_j - w_j - c_j) \frac{\partial s_j(p)}{\partial p_k} = 0, \forall k \in R^r. \quad (3)
\]

Using equation (3), the vector of margins \( \gamma_j = p_j - w_j - c_j \) for retailer \( r \) can be written in matrix notations:

\[
\gamma_r = (I_r S_p I_r)^{-1} I_r s(p) \quad (4)
\]

where \( I_r \) is a ownership matrix \((J \times J)\) with element 1 if products \( j \) and \( k \) are sold by the retailer \( r \) and 0 otherwise, \( S_p \) is the matrix \((J \times J)\) of the market share derivatives with respect to retail prices with general element \( \frac{\partial s_j(p)}{\partial p_k} \) and \( s(p) \) is the vector of market shares.

As emphasized by Shaffer (2001), the main difficulty comes from the linkage across negotiations which raises arduous questions and in particular on what each manufacturer knows about their rivals’ contract terms. Indeed, when negotiating, each manufacturer must conjecture the set of terms its rivals have or have been offered. In equilibrium, this conjecture must be correct but out-of-equilibrium beliefs may be important in determin-
ing the bargaining outcome. In the cooperative bargaining approach, this problem is solved by assuming that any bargaining outcome must be bilaterally renegotiation proof, i.e. no processor-retailer pair can deviate from the bargaining outcome in a way that increases their joint profit, taking as given all other contracts. Following Marx and Shaffer (1999), we thus assume that bargaining between each retailer-manufacturer pair maximizes the two players’ joint profit, taking as given all other negotiated contracts. Moreover, we assume that each player earns its disagreement payoff (i.e. what it would earn from the sales of their other products if no agreement on this product is reached) plus a share \( \lambda_j \in [0, 1] \) (respectively \( 1 - \lambda_j \)) of the incremental gain from trade going to the retailer (respectively to the manufacturer). We follow Draganska et al. (2010) and we assume that the firm and the retailer negotiate separately the different brands produced by the firm and that retail prices are not observable when bargaining over the wholesale prices. Then retail prices are considered as fixed when solving for the bargaining solution (see Draganska et al. (2010) for a detailed justification of this assumption).

The equilibrium wholesale price for product \( j \) is derived from the bilateral bargaining problem between a firm and a retailer such that each pair of firm and retailer maximizes the Nash product:

\[
\left[ \pi^f_j(w_j) - d^f_j \right]^{\lambda_j} \left[ \pi^r_j(w_j) - d^r_j \right]^{(1 - \lambda_j)}
\]

where \( \pi^r_j(w_j) \) and \( \pi^f_j(w_j) \) are respectively the profits of the firm and the retailer on product \( j \) with:

\[
\begin{align*}
\pi^f_j(w_j) &= (p_j - w_j - c_j) Ms_j(p) = \gamma_j M s_j(p) \\
\pi^r_j(w_j) &= (w_j - \mu_j) Ms_j(p) = \Gamma_j M s_j(p)
\end{align*}
\]

and \( d^f_j \) and \( d^r_j \) denote respectively the payoffs the firm (respectively the retailer) can realize outside of their negotiations. The retailer could gain \( d^r_j \) if he delists the supplier’s product \( j \) from his stores but contracts with other suppliers. Similarly, the firm could get profits \( d^f_j \) from the sales of his other products as well as from the sales products to other retailers if the negotiation fails. If the retail prices are fixed during the negotiation process, the disagreement payoffs \( d^f_j \) and \( d^r_j \) are given by:

\[
\begin{align*}
\sum_{k \in R^c - \{j\}} \gamma_k M \Delta s^{-j}_k(p) \\
\sum_{k \in G^c - \{j\}} \Gamma_k M \Delta s^{-j}_k(p)
\end{align*}
\]

where the term \( M \Delta s^{-j}_k(p) \) is the change in market shares of product \( k \) that occurs when the product \( j \) in no more sold on the market. Those quantities can be derived through the substitution patterns estimated in the demand model as follows:

\[
\Delta s^{-j}_k(p) = \int \frac{\exp(\delta_{kt} + \mu_{ikt})}{1 + \sum_{l=1 \backslash \{j\}} \exp(\delta_{lt} + \mu_{ilt})} - \frac{\exp(\delta_{kt} + \mu_{ikt})}{1 + \sum_{l=1}^{J_j} \exp(\delta_{lt} + \mu_{ilt})} dP_\nu(\nu).
\]
Solving the bargaining problem in equation (5) leads to the following first order condition:
\[
\lambda \left( \pi_j^f - d_j^f \right) \frac{\partial \pi_j^f(w_j)}{\partial w_j} + (1 - \lambda) \left( \pi_j^r - d_j^r \right) \frac{\partial \pi_j^r(w_j)}{\partial w_j} = 0. \tag{8}
\]

Under the assumption that the matrix of prices for final commodities is treated as fixed when the wholesale prices are decided during the bargaining process, we have \( \frac{\partial \pi_j^r(w_j)}{\partial w_j} = -M \Delta s_j(p) \) and \( \frac{\partial \pi_j^f(w_j)}{\partial w_j} = M \Delta s_j(p) \) from equation (6). Equation (8) can thus be written \( \pi_j^f - d_j^f = \frac{1 - \lambda}{\lambda} \left( \pi_j^r - d_j^r \right) \). Using equations (6) and (7a) the following expression can be derived for the bargaining solution:
\[
\Gamma_j M s_j(p) - \sum_{k \in R - \{j\}} \Gamma_k M \Delta s_k^{-j}(p) = 1 - \lambda \frac{\gamma_j}{\lambda} \left[ \Gamma_j M s_j(p) - \sum_{k \in G - \{j\}} \gamma_k M \Delta s_k^{-j}(p) \right]. \tag{9}
\]

Using equation (9) for all products \( j \), we obtain the matrix of firms’ margins:
\[
\Gamma = \sum_{f=1}^{n_f} \sum_{r=1}^{n_r} \frac{1 - \lambda}{\lambda} (I_f S I_f)^{-1} (I_r S I_r) \gamma \tag{10}
\]

where the retail margins of general element \( \gamma = \sum_{r=1}^{n_r} (I_r S p I_r)^{-1} I_r s(p) \) is derived from equation (4), \( I_f \) is the \((J \times J)\) ownership matrix with element 1 if products \( j \) and \( k \) are sold by the firm \( f \) and 0 otherwise, and \( S \) is the \((J \times J)\) matrix with market shares as diagonal elements and changes in market shares otherwise:
\[
S = \begin{bmatrix}
  s_1 & -\Delta s_2^{-1} & \cdots & -\Delta s_J^{-1} \\
-\Delta s_1^{-2} & s_2 & \cdots & -\Delta s_J^{-2} \\
\vdots & \vdots & \ddots & \vdots \\
-\Delta s_1^{-J} & -\Delta s_2^{-J} & \cdots & s_J
\end{bmatrix}.
\]

Equation (10) shows the relationship between the wholesale margin on the one hand and the retail margin on the other hand. This relationship first depends on the disagreement payoffs and thus on the market share changes that are determined by the substitution patterns estimated in the demand model. It also depends on the exogenous parameter \( \lambda_j \), the relative power of the retailer on the firm when bargaining over the wholesale price. The higher \( \lambda_j \), the lower share of the joint profit the firm will get from the bargaining.

Adding equations (10) and (4) yields the total margin of the firm/retailer pair over product \( j \):
\[
p - c - \mu = \sum_{f=1}^{n_f} \sum_{r=1}^{n_r} \frac{1 - \lambda}{\lambda} (I_f S I_f)^{-1} (I_r S I_r) + I_r S p I_r \tag{10}
\]

where \( I \) is the \((J \times J)\) identity matrix.
Because we do not directly observe firms’ marginal production costs as well as retailers’ marginal distribution cost, we are not able to analytically determine the bargaining power parameter $\lambda_j$. We rather estimate them specifying the overall channel marginal cost $C_j$ for each product $j$. We follow the following specification for the total marginal cost:

$$C_{jt} = \theta \omega_{jt} + \eta_{jt}$$

where $\omega$ is a vector of cost shifters and $\eta$ is a vector of error terms that accounts for unobserved shocks to marginal cost. The final equation to be estimated is thus given by:

$$p = \theta \omega + \left[ \frac{1 - \lambda}{\lambda} \sum_{f=1}^{n_f} \sum_{r=1}^{n_r} (I_f S I_f)^{-1} (I_r S I_r) + I \right] (I_r S p I_r)^{-1} I_r s(p) + \eta. \quad (11)$$

We are then able to get an estimates of the bargaining power parameters $\lambda$.

4 Results on demand and vertical relationships

4.1 Demand results

We estimated the demand model using individual data and the simulated maximum likelihood method as in Revelt and Train (1997).

This method relies on the assumption that all product characteristics $X_{jt} = (p_{jt}, l_j)$ are independent of the error term $\varepsilon_{ijt}$. However, assuming $\varepsilon_{ijt} = \xi_{jt} + e_{ijt}$ where $\xi_{jt}$ is a product-specific error term varying across periods and $e_{ijt}$ is an individual specific error term, the independence assumption cannot be hold if unobserved factors included in $\xi_{jt}$ (and hence in $\varepsilon_{ijt}$) as promotions, displays, advertising are correlated with observed characteristics $X_{jt}$. For instance, we do not know the amount of advertising that firms invest each month for their brand. This effect is thus included in the error term because advertising might play a role in the choice of fluid milk by households. As advertising is an appreciable share of fluid milk production costs, it is obviously correlated with prices. To solve the problem that omitted product characteristics might be correlated with prices, we use a control function approach as in Petrin and Train (2010). We then regress prices on instrumental variables, that is input prices, as well as exogenous variables of the demand equation:

$$p_{jt} = W_{jt} \gamma + \kappa_{b(j)} + \kappa_{r(j)} + \tau l_j + \eta_{jt}$$

where $W_{jt}$ is a vector of input price variables, $\gamma$ the vector of parameters associated and $\eta_{jt}$ is an error term that captures the remaining unobserved variations in prices, $\kappa_{b(j)}$, $\kappa_{r(j)}$ and $l_j$ are the exogenous variables from the demand equation. The estimated error term $\hat{\eta}_{jt}$ of the price equation includes some omitted variables as advertising variations, promotions, and shelf displays that are not captured by the other exogenous variables of the demand equation and by the cost shifters. Introducing this term in the mean utility of consumers $\delta_{jt}$ allows to capture unobserved product characteristics varying across time.
Prices are now uncorrelated with the new error term $\xi_{jt} + \varepsilon_{jht} - \pi_{jt}$. We then write

$$\delta_{jt} = \beta_{b(j)} + \beta_{r(j)} + \alpha p_{jt} + \rho l_{jt} + \xi_{jt} + \pi_{jt}$$

(12)

where $\pi$ is the estimated parameter associated with the estimated error term of the first stage.

In practice, we use the price indexes for the main inputs used in the production of fluid milk, that is raw milk, energy and packaging. Cost variables in equation (12) include the price indexes of cardboard, cow milk and gazole as it is unlikely that input prices are correlated with unobserved determinants of demand for fluid milks.\textsuperscript{2} The fluid milk industry only represents a very small share of the demand for those inputs which justify the absence of correlation between input prices and unobserved determinants of the demand for fluid milks. These variables are interacted with the manufacturers dummies or private label/national brand dummies because we expect that manufacturers obtain different prices from suppliers for raw materials and that some characteristics of the inputs (e.g. quality of cardboard) depend on the manufacturers.

We estimated two models (Table 1). Model 1 is the demand model without controlling for the endogeneity problem of prices whereas model 2 controls for it. First, the coefficient of the error term is positive and significant. It means that the unobserved part explaining prices is positively correlated with the choice of the alternative and justify the need to control for endogeneity problem. Comparison of results from model 1 and 2 reveals that the price coefficients would be underestimated (in absolute value) without controlling for the endogeneity problem and the estimates of the parameters of the model are robust to instrumentation. On average, the price has a significant and negative impact on utility. Consumers are more sensitive to the price variations of PLs compared to NBs. This is consistent with the idea that consumers might have more loyalty with respect to NBs than to PLs. Results suggest that households prefer organic products than non-organic products, since the mean coefficient is positive. However the mean value is very low and the standard deviation is relatively higher, meaning that half of households slightly value this characteristic while the others do not. The brand fixed effects reveal that private label products give the highest utility to the households with respect to the other products. This might be explained by the fact that consumers are more sensitive to the level of prices than to the brand they consume. One reason could be that fluid milk is a quite homogeneous product or at least a not too much differentiated product. From the retailer fixed effect estimation results, the effects of purchasing in one of the seven major retailers on consumer utility are heterogeneous.

### 4.2 Bargaining power and price-cost margins

Using demand estimates, we compute the retail margins using equation (4). We then estimate the parameters of equation (11) using retailers’ margins in order to get the estimated bargaining power parameters of the Nash bargaining game. As expected, the to-\textsuperscript{2}These indexes are provide by the French National Institute for Statistics and Economic Studies.
Table 1: **Results of the random coefficients logit model.**

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std</td>
</tr>
<tr>
<td>Price ($p_{jt}$)</td>
<td>0.0001 (0.0000)</td>
<td></td>
</tr>
<tr>
<td>$\times$ PL</td>
<td>-8.7441 (0.0001)</td>
<td></td>
</tr>
<tr>
<td>$\times$ NB</td>
<td>-3.1223 (0.0001)</td>
<td></td>
</tr>
<tr>
<td>Organic label ($l_j$)</td>
<td>0.0013 (0.0000)</td>
<td>0.0000 (0.0000)</td>
</tr>
<tr>
<td>Brand fixed effects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B1</td>
<td>0.1471 (0.0000)</td>
<td></td>
</tr>
<tr>
<td>B2</td>
<td>-1.2851 (0.0001)</td>
<td></td>
</tr>
<tr>
<td>B3</td>
<td>0.0358 (0.0000)</td>
<td></td>
</tr>
<tr>
<td>PL</td>
<td>5.5131 (0.0001)</td>
<td></td>
</tr>
<tr>
<td>Retailers fixed effects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R1</td>
<td>0.3115 (0.0000)</td>
<td></td>
</tr>
<tr>
<td>R2</td>
<td>-0.3318 (0.0000)</td>
<td></td>
</tr>
<tr>
<td>R3</td>
<td>0.2765 (0.0000)</td>
<td></td>
</tr>
<tr>
<td>R4</td>
<td>0.1037 (0.0000)</td>
<td></td>
</tr>
<tr>
<td>R5</td>
<td>0.9707 (0.0000)</td>
<td></td>
</tr>
<tr>
<td>R6</td>
<td>-0.1806 (0.0000)</td>
<td></td>
</tr>
<tr>
<td>R7</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Error term ($\eta_{jt}$)</td>
<td></td>
<td>0.8407 (0.0003)</td>
</tr>
<tr>
<td>Log Likelihood</td>
<td>-920,309</td>
<td></td>
</tr>
<tr>
<td>Number of observations</td>
<td>322,755</td>
<td></td>
</tr>
</tbody>
</table>

Standard errors are in parenthesis
Table 2: Manufacturers and retailers margins

<table>
<thead>
<tr>
<th>Brands</th>
<th>Characteristic</th>
<th>Manufacturer's margins</th>
<th>Retailer's margins</th>
<th>Total margins</th>
</tr>
</thead>
<tbody>
<tr>
<td>NB1</td>
<td>C</td>
<td>20.33 (10.76)</td>
<td>34.22 (5.75)</td>
<td>54.56 (7.43)</td>
</tr>
<tr>
<td>NB2</td>
<td>O</td>
<td>45.26 (2.93)</td>
<td>20.35 (1.51)</td>
<td>65.61 (3.15)</td>
</tr>
<tr>
<td>NB3</td>
<td>C</td>
<td>31.20 (14.35)</td>
<td>29.28 (5.68)</td>
<td>60.49 (9.32)</td>
</tr>
<tr>
<td>NB4</td>
<td>C</td>
<td>25.35 (6.06)</td>
<td>32.41 (4.31)</td>
<td>57.76 (6.21)</td>
</tr>
<tr>
<td>NB5</td>
<td>O</td>
<td>51.50 (8.58)</td>
<td>18.59 (2.94)</td>
<td>70.09 (9.57)</td>
</tr>
<tr>
<td>PL1</td>
<td>C</td>
<td>7.93 (6.55)</td>
<td>18.32 (2.84)</td>
<td>26.26 (5.45)</td>
</tr>
<tr>
<td>PL2</td>
<td>O</td>
<td>31.94 (2.89)</td>
<td>11.81 (1.18)</td>
<td>43.76 (2.76)</td>
</tr>
</tbody>
</table>

C: Conventional, O: Organic

total margin is higher for NB products compared to PL products. As shown in Table 2, the highest total margin obtained for NB1 is three to six times higher than the total margin for the PL. The total margin is always lower for the conventional milk brands compared to the organic ones. However, when splitting these margins between retailers and manufacturers, results with respect to the brand and conventional/organic features differ for firms and retailers. Results suggest that retailers’ margins are higher for conventional fluid milk than for organic ones, respectively 29% and 17% on average. Results also show that the margins of retailers vary across retailers and range between 10% and 48% and that they are higher for national brands (28%) than for private labels (15%). On the contrary, manufacturers’ margins are higher for organic brands (42% compared to 21% for conventional brands), which suggests that manufacturers may benefit more for their organic brand compared to their conventional milk ones. While the margins at the manufacturing stage is quite low for conventional fluid milk sold under private labels, manufacturers seem to be able on the contrary to extract more margin from the sales of organic milk.

To get more insight on the impact of conventional/organic attributes of fluid milk on the relative bargaining power of manufacturers, we provide in Table 3 the bargaining power estimates, that is the shares of the joint profit that are captured by retailers. The estimated bargaining power of manufacturers is much higher for its organic products than for its conventional ones. Indeed, the bargaining power of retailers is lower for the national brand NB2 and NB5 as well as for the private labels PL2, which indicates that retailers have less bargaining power than manufacturers for organic brands whatever the retailer/manufacturer pair. For conventional brands, results are more contrasted. As expected retailers have a very high bargaining power for the private label, even though this retailer advantage is not clear for some retailers. For the national brands NB1 and at a lesser extent NB4, retailers seem to have more bargaining power while the opposite result seems to prevail for NB3. In addition, we can observe a large heterogeneity of the bargaining power parameters across brand-retailer pairs.

One might ask why retailers should have incentive to offer organic products on their shelves as they seem to be able to exert less bargaining power for organic milk and their margins are lower for these products. As emphasized by Bezawada and Pauwels (2013), when offering organic products in their shelves, retailers may not only increase their sales
Table 3: **Brand-retailer estimates of bargaining power.**

<table>
<thead>
<tr>
<th></th>
<th>NB1</th>
<th>NB2</th>
<th>NB3</th>
<th>NB4</th>
<th>NB5</th>
<th>PL1</th>
<th>PL2</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>0.74</td>
<td>0.30</td>
<td>0.42</td>
<td>0.56</td>
<td>0.30</td>
<td>0.82</td>
<td>0.29</td>
</tr>
<tr>
<td>R2</td>
<td>0.52</td>
<td>0.28</td>
<td>0.98</td>
<td>0.50</td>
<td>0.22</td>
<td>0.98</td>
<td>0.23</td>
</tr>
<tr>
<td>R3</td>
<td>0.66</td>
<td>0.29</td>
<td>0.42</td>
<td>0.51</td>
<td>0.26</td>
<td>0.57</td>
<td>0.23</td>
</tr>
<tr>
<td>R4</td>
<td>0.50</td>
<td>0.31</td>
<td>0.39</td>
<td>0.60</td>
<td>0.22</td>
<td>0.64</td>
<td>0.24</td>
</tr>
<tr>
<td>R5</td>
<td>0.57</td>
<td>0.32</td>
<td>0.45</td>
<td>0.64</td>
<td>0.28</td>
<td>0.58</td>
<td>0.23</td>
</tr>
<tr>
<td>R6</td>
<td>0.44</td>
<td>0.27</td>
<td>0.34</td>
<td>0.42</td>
<td>0.21</td>
<td>0.42</td>
<td>0.22</td>
</tr>
<tr>
<td>R7</td>
<td>0.98</td>
<td>0.57</td>
<td>0.99</td>
<td>0.30</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Standard errors are in parenthesis

in the fluid milk product category but they can also increase their store profits by enhancing their long term image through the supply of organic products.

5 Conclusion

This study thus gives insight on the availability of firms to countervail the buying power of retailers through the use of organic labeling using a model of Nash bargaining with linear contracting between two parties for each product. More specifically, based on a structural econometric model, we assess how the value added created by the existence of an organic label in a vertical chain is shared among manufacturers and retailers in the French fluid milk market. Given the substituability patterns between the different brands that have different characteristics (NB, PL, conventional milk, organic milk), we show that organic label leads to higher total margins and provides a higher bargaining power to manufacturers. It results that firms’ margins (respectively retailers’ margin) are higher (lower) for organic products compared to conventional milk. Moreover, we show that retailers’ margin on private labels is lower for organic milk and that their relative bargaining power is low even if they sell the products using their own label. Furthermore, the bargaining power is more in favor of retailers on average but there exists a large heterogeneity depending on the retailer and the product pair.

In future works, we want to consider how these results would be affected if the manufacturer/retailer pair has the possibility to negotiate on the bundle of brands compared to a separate negotiation product by product.

References


