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Strategic Effects of Private Labels and Horizontal Integration

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ABSTRACT *Why would retailers want to introduce private labels in a given product category? This paper examines this question, focusing especially on the effects of the emergence of private labels on the relative power of retailers vis à vis national brand manufacturers. The analysis allows for different degrees of competition in the vertical structure, and for linear and non-linear pricing. We show that retailers' gains from introducing private labels increase with the concentration of the retail market both with linear and non-linear pricing.*

KEY WORDS: Retailers, private labels, power, manufacturers, strategic effects, grocery, competition

Introduction

There is some evidence that there has been a shift in the balance of power between manufacturers and retailers, in favour of the latter. One aspect of the evidence cited is the proliferation of private labels (also called store brands). These brands have had an impressive growth in the past few decades in many countries and product categories (Staahl & Sorgard 2000; Dobson & Waterson 1998 and 1999; Connor, Rogers & Bhagvan 1996; Quelch & Harding 1996). According to the Private Label Manufacturers' Association (PLMA, 2002), private labels account for one of every five items sold daily in US supermarkets, drug chains and mass merchandisers, representing, as of the end of 2002, a $51.6 billion segment of the retailing business. In an international review, the Boston Consulting Group (2003) reveals that in countries such as the UK, Belgium, Germany, France, Spain, Italy and the US, the share of store brands in total grocery store sales increased substantially between 1997 and 2002, in some cases to over 30%. Moreover, countries as diverse as Canada, Australia, the Philippines, Hong Kong, Mexico and Chile have experienced the same phenomenon (AC Nielsen 2001 and Agricultural and Agri-Food Canada, 2002).

Private labels have changed the relationship between retailers and manufacturers by placing retailers in a dual position as both manufacturers' clients and competitors in production. Since private label development gives retailers a more active role in production decisions, which have remained somewhat neglected in the

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economic literature on vertical restraints, a better understanding of this widespread phenomenon and its implications is an interesting topic.

One of the main objectives of this paper is to analyse the effects of the interactions between retailers and a national brand manufacturer, allowing for varying degrees of concentration in the retail market. The models, presented so far in the theoretical literature, to analyse the impact of the introduction of private labels on the behaviour of variables, such as profits and prices, have assumed a market structure with only one retailer that may distribute the national brand (e.g. Mills 1995, 1999; Narasimhan & Wilcox 1998). However, national brand manufacturers may face different levels of competition in the market channels they use to distribute their products.

Theoretically, the existence of a private label in a category changes bargaining over supply conditions between a national brand manufacturer and retailers. However, we believe that the effects of private label introductions on retailers' and manufacturers' market power partially depend on the concentration of the retail market. We suggest that incentives to horizontal integration increase whenever retailers may also offer a private label, and that these incentives are increasing in the quality of the private label.

We believe that our analysis is interesting because, across countries, private labels' market share in grocery sales appears to vary directly with concentration in the retail grocery sector (Delisser & Helliker 1994; Reid 1995). This empirical finding suggests that there may be a retail market power explanation for the success of private labels in different countries. The effect of the retailer's concentration on private label marketing is also important since concentration levels in retail markets have increased markedly as large chain groups have become prevalent.

Since it is widely observed in the real world, we also analyse non-linear pricing. This case is interesting because national brand manufacturers may employ non-linear pricing as a counter strategy to defend their brand against a private label attack.

Despite this, the academic literature on private labels is still in its infancy. Some papers have recognized explicitly the shift in the distribution of power between manufacturers and retailers as a result of the emergence of private labels. Most of the theoretical studies show that, in a successive monopoly model, marketing of private labels increases both the profits of the vertical structure and consumer surplus. Mills (1995) presented a model of interaction between a national brand producer and a single retailer that offers a competing private label along with the national brand. He shows that private labels will be sold if they reach a minimum quality threshold and that, when they are sold, their introduction will result in lower prices to consumers, improving the performance of the vertical structure. Raju, Sethurman & Dhar (1995) also studied the theoretical effect of the introduction of a private label, finding that it is likely to result in an increase in both the retailer's profits in a given product category and the private label share if the cross-price sensitivity between the national brands and the store brand is high. They do not provide comparative statistics concerning how introducing a private label affects prices of national brands.

Narasimhan & Wilcox (1998) analysed the effects of the introduction of private labels on prices in a market structure where there is a single retailer that sells a

national brand that competes with a private label. They found that the private label triggers a battle over market shares that results in lower wholesale prices for the manufacturers of national brands but has no effect on their retail price. Mills (1999) analyses whether national brand manufacturers might have counterstrategies to defend their brands from a competing private label to appropriate for themselves some of the profits available in the vertical structure locked up by double marginalization. Among such strategies, Mills examines the introduction of a 'fighting brand' and various nonlinear pricing and coupon alternatives. He finds that the most effective tools to limit the effectiveness of a retailer's private label marketing are to invest in widening the quality gap of the national brand and in information to capture, through nonlinear prices, the profits accruing to retailers by selling national brands.

On the empirical side, most of the literature on private labels are studies trying to explain the variation in private label penetration across product categories (Sethuraman 1992; Hoch & Banerji 1993); the market characteristics that explain differences in store brand market share across product categories (Raju, Sethuraman & Dhar 1995); and the use of brand proliferation (Putsis 1997) or advertising (Cotterill, Putsis & Dahr, 2000) as a strategy to affect private labels entry, prices and success in the marketplace. The results of the empirical literature regarding the effects of private label introduction on the prices of national brands and private labels are mixed. Putsis (1997) finds that private label introduction lowers the average price of national brands, while Parker and Kim (1995) find that private label introduction can raise the price of national brands. Cotterill, Putsis & Dahr (2000) find that in some product categories an increase in the marketing of private labels raises the prices of national brands, while in other categories the opposite is true.

The paper is organized as follows: in the next section the model is described. Then the equilibrium values are presented and the main results discussed. A summary and conclusions are presented finally.

The Model

Basic Assumptions

Assume a market where manufacturers sell both national brands and private labels through common retailers. Two types of brands are distinguished in a given product category. First, retailers may sell a national brand (n) provided by a manufacturer. Because of differentiation efforts in special design, packaging, advertisement and brand reputation, the producer of the national brand has market power on it. Retailers may also carry a store brand (s), which is store specific. Given that retailers can obtain the private labels from any manufacturer, the supply of private labels is assumed to be perfectly competitive and, then, manufacturers of store brands do not earn economic rents from supplying them. Thus, in our model, the manufacturer of the private label is not a strategic player and has no bargaining power.

The national brand manufacturer charges a unit linear price of 'w'. Retailers sell the national brand to consumers at P_n. The only variable cost for retailers is the

price paid to manufacturers for the national brand and private label, although they may have other fixed and sunk costs. As the market for manufacturing private labels is competitive, a retailer procures the store brand at a price equal to its marginal cost of production. Retailers sell the private label to consumers at P_s. The marginal cost (c) of the national brand and the private label are identical. Thus, the only differences in costs between both goods are the fixed and sunk costs incurred by national brand manufacturers to help in their differentiation efforts to maintain the brand's reputation and perception of superior quality. To simplify, we assume $c = 0$.

In the market there are t symmetric retailers. When $t = 1$, the retailer behaves as a monopolist, while when $t > 1$ they compete *à la* Cournot. Consumers perceive the private label carried by each retailer as of similar quality. The decision sequence of the game is as follows: in the first stage, the manufacturer sets the national brand's wholesale price, anticipating the retailers' second stage reaction. In the second stage, each retailer sets the quantity demanded of both the national brand and the private label. Thus, the decision variable for the national brand manufacturer is the wholesale price to charge retailers while the decision variables for each retailer are the quantity of each product to buy from manufacturers and the consumer prices of each product. Based on the prices of both goods, consumers decide which item, if any, to purchase. As the national brand manufacturer knows the retailers' reaction functions, the resulting equilibrium is sub game perfect. We also analyse the case where the national brand manufacturer may charge a two-part tariff maintaining the same decision sequence.

Demand Structure

Consumers buy, at the most, one unit of the good, which may be either the national brand or the private level. The utility (net of cost) derived by a consumer for buying the national brand is $\theta - p_n$ while the utility (net of cost) derived by consuming the private label is $\delta\theta - p_s$, where θ is a consumer-specific taste parameter. Utility is zero if neither good is bought. We assume that there is a continuum of consumers with θ uniformly distributed on [0, 1] and density equal to 1. δ indicates the degree of substitutability of the private label for the national brand or, equivalently, it is an index of the quality of the private label. As such, as δ rises the private label becomes a better substitute for the national brand. We assume that $\delta \in (0, 1)$ and, thus, that consumers prefer, at the same price, the national brand. The consumer chooses the option that provides the highest level of utility.

This preference structure implies that consumers prefer, at the same price, a national brand to a private label because of, for example, perceived quality differences between the two (Hoch & Banerji 1993). Since consumers have different values of θ, the vertical structure has a degree of market power. With this preference structure, consumers who buy the national brand are those for whom equation (1) is satisfied:

$$\theta - p_n \geq \delta\theta - p_s \quad \text{or} \quad \theta \geq \frac{p_n - p_s}{1 - \delta} \tag{1}$$

In addition to condition (1), consumers who buy the national brand are those for whom $\theta - \mathrm{p_n}$ is greater than 0. On the other hand, consumers who buy the private label are those for whom equation (2) is satisfied:

$$\delta\theta - p_s \geq 0 \quad \text{or} \quad \theta \geq \frac{p_s}{\delta} \tag{2}$$

From (1) and (2) it follows that the private label is sold whenever:

$$\frac{p_n - p_s}{1 - \delta} > \frac{p_s}{\delta}$$

As the national brand will be sold only when $P_n < 1$, both products will be sold when $P_s < \delta P_n$ and $\mathrm{P_n} < 1$. Since $\theta \leqslant 1$, the demand for each product, when both goods are sold, is given by (3) and (4) below:

$$q_n = \int_{\frac{P_n - p_s}{1-\delta}}^{1} \delta\theta = 1 - \frac{p_n - p_s}{(1-\delta)} \tag{3}$$

$$q_s = \int_{\frac{p_s}{\delta}}^{\frac{p_n - p_s}{1-\delta}} \delta\theta = \frac{p_n - p_s}{(1-\delta)} - \frac{p_s}{\delta} \tag{4}$$

According to equations (3) and (4) the demand for each product is decreasing in its own price and increasing in the price of the substitute good. Notice that when both products are sold, consumers who buy the national brand are those with higher values of θ. We restrict ourselves to those prices and quantities that are non-negative.

If $P_s \geqslant \delta P_n$ and $P_n < 1$, the price of the private label relative to the price of the national brand would be so high that no consumer would buy the private label. In this case, the demand for the national brand would be given by equation (5):

$$q_n = \int_{p_n}^{1} \delta\theta = 1 - P_n \tag{5}$$

Equilibrium

We solved the game backwards, starting with the retailer's decision. A retailer i that may sell a national brand and a private label maximizes in equation (6):

$$\pi^r = (p_n - w)q_{n,i} + (p_s - c)q_{s,i} \tag{6}$$

where $q_{n,i}$ and $q_{s,i}$ are the quantities of the national brand and the private label sold by retailer i. Replacing the demand functions (3) and (4) in (6), we have that a retailer i chooses $q_{n,i}$ and $q_{s,i}$ so as to maximize equation (7):

$$\pi^r = (1 - q_{n,i} - \sum_{j \neq i} q_{n,j} - \delta q_{s,i} - \delta \sum_{j \neq i} q_{s,i} - w)q_{n,i} + (\delta - \delta q_{s,i} - \delta \sum_{j \neq i} q_{s,j} - \delta q_{n,i} - \delta \sum_{j \neq i} q_{n,j} - c)q_{s,i} \quad (7)$$

On the other hand, prior to store brand introduction, the retailer selects the quantity of the national brand to buy so as to maximize in equation (8):

$$\pi^r = (p_n - w)q_{n,i} = (1 - q_{n,i} - \sum_{j \neq i} q_{n,j} - w)q_{n,i} \quad (8)$$

The national brand manufacturer problem involves the selection of a wholesale price that maximizes its profits considering the retailers' reaction functions. Hence, the manufacturer maximizes in equation (9):

$$\pi^m = (w - c)Q_n \quad (9)$$

where $Q_n = \sum_{i=1}^{t} q_{n,i}$.

Column A of Table 1 summarizes the equilibrium quantities, prices, manufacturer and retailer's profits of this two-stage sequential game when the retailer may sell a private label. To provide us with a benchmark to compare the effects of private

Table 1. Equilibrium values of quantities, prices and profits.

	Column A	Column B
$q_{n,i}^*$	$\frac{1}{2(t+1)}$	$\frac{1}{2(t+1)}$
$q_{s,i}^*$	$\frac{\delta}{2\delta(t+1)}$	—
P_n^*	$\frac{2+t-\delta t}{2(t+1)}$	$\frac{2+t}{2(t+1)}$
P_s^*	$\frac{\delta}{(t+1)}$	—
w^*	$\frac{1-\delta}{2}$	$\frac{1}{2}$
π^m	$\frac{t(1-\delta)}{4(t+1)}$	$\frac{t}{4(t+1)}$
π^r	$\frac{1+3\delta}{4(t+1)^2}$	$\frac{1}{4(t+1)^2}$

label introduction, column B shows the equilibrium quantities, prices, manufacturer and retailer's profits of the sequential game when retailers cannot sell private labels. The equilibrium obtained in each case is the unique Stackelberg equilibrium. Consequently, assuming that the wholesale price is given by w^*, the retailer has no incentives to deviate from equilibrium retail prices P_n^* and P_s^* and, for a given P_n^* and P_s^*, the national brand manufacturer has no incentives to deviate from w^*.

As can be seen in table 1, the wholesale price and the consumer's price of the national brand decreases with the emergence of a private label, and decreases further as the private label becomes a better substitute for the national brand. Moreover, the total availability of goods to consumers in a given product category increases with the emergence of a private label. Below, we discuss some of the main implications of the results presented in table 1, assuming that the national brand manufacturer charges a linear price. Later, we analyse the case where the manufacturer may charge a two-part tariff.

Effects of Private Labels and Concentration on the Lerner Index of Market Power

Defining the Lerner index of retailer market power on the national brand and the private label, when retailers sell private labels, as $LIN_1 = (P_n - w)/P_n$ and $LIP = (P_s - c)/P_s$ respectively, and the Lerner index of market power on the national brand when retailers do not sell a private label as $LIN_0 = (P - w)/P$, we obtain equations (10) and (11) and proposition 1 that follows:

$$LIN_1 - LIP = \frac{(\delta - 1)(t + 1)}{2 + t - t\delta} \tag{10}$$

$$LIN_1 - LIN_0 = \frac{2\delta(t + 1)}{(2 + t)(2 + t - t\delta)} \tag{11}$$

Proposition 1: (a) The Lerner index of retailer market power on the private label is higher than the Lerner index of retailer market power on the national brand for any level of retail market concentration. (b) The Lerner index of retailer market power on the branded product is higher when retailers sell private labels along with the national brand.

Part (a) of proposition 1 comes from $LIN_1 - LIP < 0$ and it reflects that retailers have more market power on private labels than on national brands. This result is explained by the double marginalization problem that reduces the retailer's margin on the national brand and is consistent with a survey by Libre Service Actualites (1996). This survey shows that the average retail gross margin on private labels is nearly 23 % of total sales, whereas it is only 15 % for national brands.

Part (b) of proposition 1 comes from $LIN_1 - LIN_0 > 0$. According to this result, the Lerner index of retailer market power on the branded product is higher when retailers sell private labels along with the national brand. This result arises because the fall in the wholesale price of the national brand as a consequence of the intro-

duction of the private label is larger than the fall in the consumer price of the brand for any degree of retail market concentration (see table 1).

Retailers' Market Power and National Brand Manufacturers' Power

To analyse directly the relative power of retailers *vis à vis* national brand manufacturers, we define an index that we call *RMP*, which corresponds to the Lerner index of retailer market power over the Lerner index of the national brand manufacturer market power. A higher value for this index would indicate that the power of the vertical structure is shifting from the national brand manufacturer to retailers. Equations (12) and (13) show the value of *RPM* when retailers sell private labels (RPM_1) and when they do not (RPM_0). Proposition 2 is based on equations (12) and (13).

$$RPM_1 = \frac{2(\delta + 1)}{(2 + t - t\delta)(\delta - 1)} \tag{12}$$

$$RPM_0 = \frac{2}{(2 + t)} \tag{13}$$

Proposition 2: The retailer's power relative to the national brand manufacturer's power is: i) higher when retailers sell private labels, ii) increasing with the quality of the private label and iii) increasing with the concentration of the retail market.

Part i) of proposition 2 comes from $RPM_1 > RPM_0$ while part ii) comes from $dRMP_1/d\delta > 0$. Finally, part iii) comes from $dRMP_1/dt < 0$. This proposition shows that the power in the vertical structure shifts from manufacturers to retailers as the latter sell private labels of better quality. The main explanation for this result is the lower market power that goes to national brand manufacturers when there are better substitutes for their products.

Moreover, the relative power of retailers increases as the retail market becomes more concentrated, both because national brand manufacturers have a smaller number of retailers to distribute their products through, and because a smaller number of retailers gives them more power against consumers (as is standard in Cournot models).

Effect of Private Label Introduction and Retail Market Concentration on Double Marginalization

Private labels may help overcome the double marginalization problem inherent in the distribution of the national brand (Mills 1995). Double marginalization arises because when manufacturers and retailers have market power in their markets, each charge a price above the marginal cost. Thus, there will be two successive mark-ups and the price paid by consumers will be higher than the price they would pay in an integrated structure where there would be only one mark-up (Spengler 1950).

Equations (14) and (15) show the total margin of the vertical structure (*SM*), defined as the sum of retailer and manufacturer margins, when retailers do sell (SM_1) and do not sell (SM_0) private labels.

$$SM_1 = \frac{2 + t - \delta t}{2(t+1)} \tag{14}$$

$$\mathrm{SM}_0 = \frac{2 + t}{2(t+1)} \tag{15}$$

Notice that the total margin of the vertical structure is increasing with the concentration of the retail market ($dSM/d\mathrm{t} < 0$), both when retailers do and do not sell private labels. Since the space available to bargain by retailers and national brand manufacturers depends on the total margin available in the vertical structure, it follows that the relative bargaining power of each member of this structure becomes more important as the concentration of the retail market increases.

To compare the total margin of the vertical structure before and after the introduction of private labels, we define $DSM = SM_0 - SM_1$, where:

$$DSM = \frac{t\delta}{2(t+1)} \tag{16}$$

Since *DSM* is positive, the double marginalization problem diminishes as retailers also sell private labels. Furthermore, as ($dDSM/d\delta > 0$), the difference in the sum of margins by selling private label is increasing in the quality of the private label. Thus, marketing of private labels that are closer substitutes of national brands further reduces the double marginalization problem by introducing more competition on the vertical structure. Proposition 3, that follows, shows the relationship between *DSM* and the level of concentration of the retail market for different degrees of substitution between the national brand and the private label. This proposition is important to understand how significant the effect of introducing a private label is on the performance of the vertical structure for different concentration levels of the retail market.

Proposition 3: *DSM* is decreasing with the concentration of the retail market. Moreover, the gain in performance of the vertical structure by introducing private labels that are better substitutes of the national brand is also decreasing with the concentration of the retail market.

The first part of proposition 3 comes from $dDSM/d\mathrm{t} > 0$ and shows that the gain in the performance of the vertical structure by marketing private labels in addition to national brands is smaller as the retail market is more concentrated. This result is explained by the additional market power that goes to each retailer when each of them may co-ordinate the pricing of a category of substitute products. This co-ordination depends on the level of competition in the retail market—giving maximum rewards to a retailer, with highest prices to consumers—when each of the goods in the category is supplied by one retailer, and giving no additional rewards when there is perfect competition at the retail level in at least one of the two products. Moreover, as the pricing co-ordination of a product category works better as products become closer substitutes, the gain in performance

of the vertical structure by introducing private labels decreases further with a higher concentration of the retail market ($dDSM/d\delta/dt > 0$).

Effects of Retail Market Concentration and Private Label Introduction on Retailer Profits and Incentives to Horizontal Integration

The introduction of private labels has a direct consequence on retailers' profits and incentives to horizontal integration. Defining retailers' profits when they sell only a national brand as π^r and retailers' profits when they sell private labels and national brands as $\pi^{r,pl}$, we obtain $\Delta\pi^r = \pi^{r,pl} - \pi^r$, where:

$$\Delta\pi^r = \frac{3\delta}{4(1+t)^2} \tag{17}$$

Since $\Delta\pi^r > 0$, retailers' profits are higher if they also sell private labels. Moreover, since $d\Delta\pi^r/d\delta > 0$, the rise in a retailer's profits by marketing private labels that are in their quality higher, i.e. as the quality of the private label improves, the rise in a retailer's profit by selling private lables is higher. These results help to explain the retailers' efforts to carry private labels that look as close as possible to the main national brand in the category, for example in packaging shapes and colours.

Furthermore, since $d\pi^{r,pl}/dt < 0$ and $d\pi^r/dt < 0$, retailers' profits are increasing in the concentration of the retail market, both when retailers do and do not sell competing private labels. These results are consistent with one of the cornerstone results of the standard Cournot model of oligopoly that says that industry profits are decreasing in the number of firms in the industry.

To assess the effect of private label introduction on a retailer's profits for different levels of retail market concentration, we compute $d\Delta\pi^r/dt$. Since $d\Delta\pi^r/dt < 0$, the positive effect on profits from selling private labels is increasing with the concentration of the retail market. In fact, for a given quality of the private label, $\Delta\pi^r$ is maximized when $t = 1$ and minimized when t tends to infinity ($\lim_{t\to\infty} \Delta\pi^r = 0$). Thus, the increase in a retailer's profits as a result of a higher concentration in the retail market is larger when retailers sell private labels along with a national brand. Furthermore, since $(d(d(\Delta\pi^r)/d\delta)/dt < 0$, the rise in a retailer's profits as a result of an improvement in the quality of the private label is increasing with the concentration of the retail market. From these results, we derive proposition 4:

Proposition 4: The rise in a retailer's profit as a result of a higher concentration in the retail market is larger when retailers sell private labels along with a national brand. Moreover, the positive difference in profits for a retailer by selling private labels as a result of the same increase in concentration is increasing with the quality of the private label.

The proposed results contained in proposition 4 show that retailers' incentives to increase the concentration of the retail market (for example, through mergers and acquisitions) are higher when they also sell private labels and are increasing the perceived quality of the private label. These results agree with some findings (Delisser & Helliker 1994; Dobson & Waterson 1999) that show that the level of

concentration in the retail market is directly related with the private label's market share in retail sales.

The relationship between the growing importance of private labels for retailers and the incentives to horizontal integration in the retail industry may be explained by at least two of the reasons discussed above. First, the additional bargaining power that goes to retailers against national brand manufacturers by marketing private labels is relatively more important as the retail market is more concentrated, because the sum of retailer and national brand manufacturer margins is increasing with the concentration of the retail market. Second, retailers obtain an additional advantage from concentration against consumers when they sell substitute goods because a higher concentration enables each of them to better coordinate the pricing of their product lines.

Effects of Retail Market Concentration and Private Label Introduction on Manufacturers' Profits

Next, we briefly analyse the main effects of private label introduction and retail market concentration on the national brand manufacturer. Defining the national brand manufacturer's profit when retailers do not sell and when they do sell private labels as π^{m} and $\pi^{m,pl}$ respectively, and $\Delta\pi^{m} = \pi^{m,pl} - \pi^{m}$, we obtain equation (18) that follows:

$$\Delta\pi^{m} = -t\frac{\delta}{4(1+t)} \tag{18}$$

Since $\Delta\pi^{m} < 0$, the profits of the national brand manufacturer are lower when retailers also carry competing private labels. Moreover, as $d\Delta\pi^{m}/d\delta < 0$ the fall in the national brand manufacturer's profits are larger as the quality of the private label improves, i.e. the marketing of private labels of better quality hurts a national brand manufacturer further (Dhar & Hoch 1997). These results help to explain the efforts of national brand manufacturers to differentiate their products and avoid copying from private labels.

Moreover, since $d\pi^{m,pl}/dt > 0$ and $d\pi^{m}/dt > 0$, the national brand manufacturer's profits are decreasing with the concentration of the retail market, both when retailers sell and when they do not sell competing private labels. These results confirm that a manufacturer with market power will rather have more competition downstream to face a higher demand for his product.

Nonlinear Pricing

In this section we analysed nonlinear pricing. Nonlinear pricing may be a counterstrategy employed by a national brand manufacturer to defend their brand against a private label attack. As seen below, this strategy may increase manufacturer profits. Consumers may also derive benefits from nonlinear pricing.

An example of nonlinear pricing is a two-part tariff *(f,w)* where f is a fixed payment from the retailer to the national brand manufacturer and w is the price per unit of output sold by the national brand manufacturer. Next, we analyse the

national brand manufacturer's incentives to use nonlinear pricing and the relationship of these incentives with the concentration of the retail market and the emergence of a private label of varying levels of quality.

To assure that the retailer will charge a price to consumers such that the profit of the vertical structure is maximized, the national brand manufacturer sets a wholesale price equivalent to the marginal cost of production. Since the marginal cost of the private label and the national brand were assumed identical, total profits of the vertical structure are maximized when retailers sell only the national brand. In this case, each retailer produces:

$$q_i = 1/(1+t) \tag{19}$$

and the retail price is set at:

$$P = 1/(1+t) \tag{20}$$

With these prices and quantities, a retailer's profits are equal to:

$$\pi^r = 1/(t+1)^2 \tag{21}$$

while the total profits of the vertical structure are equal to:

$$t/(t+1)^2$$

When there is not a private label, a national brand manufacturer cannot charge more than $1/(t+1)^2$ to each retailer as a fixed fee, assuming that they charge a wholesale price equal to their marginal cost. When retailers can market a private label, they can refuse to pay the fixed fee to the manufacturer if it exceeds the profits captured by selling only the private label. Since the maximum profit that can be achieved by a retailer selling only the private label is:

$$\pi^{r1} = \delta^2/\delta(t+1)^2 \tag{22}$$

the maximum fee that can be charged by a national brand manufacturer when retailers may sell a private label of quality δ is given by expression (23)

$$f = \pi^r - \pi^{r1} = 1/(t+1)^2 - \delta/(t+1)^2 = (1-\delta)/(t+1)^2 \tag{23}$$

Thus, with a fee of maximum $f = (1-\delta)/(t+1)^2$ and $w = c = 0$, the retailer will prefer to sell only the national brand. If the national brand manufacturer charges a fee higher than f, the retailer will prefer to market only the private label.

As the private label becomes a better substitute of the national brand, f decreases ($d(\pi^r - \pi^{r1})/d\delta < 0$) and retailer profits increase ($d\pi^{r1}/d\delta > 0$). These results show that the national brand manufacturer's ability to charge a two-part tariff erodes as the retailer is able to carry better substitutes of the national brand. Thus, when retailers may distribute a private label, there is a shift in the distribution of total profits between retailers and national brand manufacturers favouring

retailers, with the equilibrium profits of each participant depending on the quality of the private label.

To implement an optimal two-part tariff, the national brand manufacturers must have complete information about the consumer demand for their product and the perceived quality of the private label that retailers may produce. If there is uncertainty about these variables, the manufacturer is at an informational disadvantage. According to Tirole (1988) a similar problem arises if the retailer is more risk-averse than the manufacturer and demand fluctuations are stochastic. Moreover, as the concentration of the retail market increases, it is more likely that retailers will retain private information and, thus, it will be harder for national brand manufacturers to implement optimal nonlinear pricing.

Bargaining with two-part tariffs. Negotiating over supply terms has become standard practice in the retail industry. As a result of the consolidation of power among retail giants, manufacturers can no longer dictate the conditions of trade. To see the bargaining power of each part, we compute the disagreement payoff, defined as what a firm would earn if negotiations failed. It is assumed that each firm earns its disagreement payoff plus a share of the incremental gains from trade (Shaffer & Zettelmeyer 1999). In this section, we describe the redistribution of channel profits as a reason to carry private labels and not other reasons such as to segment consumers to charge differentiated prices to them.

As was derived in the previous section, when retailers cannot carry a private label, the national brand manufacturer can charge $(f,w) = (1/(t+1)^2, c)$. In this case, the disagreement payoff for a retailer is zero, because retailers will not earn a profit if the national brand manufacturer refuses to supply his product. However, when the same retailer may carry a private label of quality δ, the disagreement payoff for a retailer is $\delta/(t+1)^2$. The disagreement payoff for the retailer is increasing with the quality of their private label.

To discuss why retailers may want to market private labels we can use the simple insight that the national brand manufacturer can obtain, as a maximum payment from a retailer, its incremental contribution: defined as the difference between the maximum profits obtained by retailers when they do and do not sell the national brand. From the above results, it follows that this difference equals $(1-\delta)/(t+1)^2$. Since the incremental contribution of the national brand manufacturer decreases with the increase in the perceived substitutability between the national brand and the private label, retailers will prefer to carry private labels that look as close as possible to the leading national brands in their category. Then, following this reasoning, retailers may want to carry a private label only to extract channel profits from national brand manufacturers. When they carry a private label that is a closer imitation of the national brand, retailers have better profit opportunities in cases where negotiations do not lead to a beneficial agreement to sell the national brand.

The above reasoning suggests that retailers will be more interested in introducing a private label to counteract high national brand manufacturer bargaining power by decreasing the manufacturer's incremental contribution to the vertical structure when they can sell a private label that is a closer substitute of the national brand. The idea behind this statement is that the amount the retailer can

gain by an improved bargaining position depends on the extent to which private labels can lower the contribution of the national brands. As such, when the bargaining power of the national brand manufacturer is low, even without the threat of a substitute private label, the retailer may already collect most of the profits of the vertical structure.

Summary and Conclusions

Our results provide some insights into the pricing of national brands and private labels, as well as some intuition for the increase in the concentration of retail markets and the emergence of private labels. According to our findings, the increase in the concentration of retail markets that we are seeing in a number of countries is consistent with the growth in private label sales that has been occurring in the last couple of decades.

The key departure of our setting, from most of the theoretical models presented in the literature, is that we allow for different degrees of concentration in the retail market. In this analysis we conclude that the effects of private label introduction on most of the variables analysed were sensitive to the concentration of this market. As an example, we conclude that the rise in retailers' profits, as a result of an improvement in the quality of the private label, is increasing with the concentration of the retail market. This means that retailers have more incentives to buy private labels of better quality as the retail market is more concentrated. Another important finding is that the gain in the performance of the vertical structure by marketing private labels in addition to national brands is less important as the retail market becomes more concentrated.

We show that when retailers distribute a private label, there is a shift in the distribution of total profits between retailers and national brand manufacturers in favour of retailers, with the equilibrium profits of each participant depending on the quality of the private label. National brand manufacturers may use strategies such as nonlinear pricing to defend their brands against a private label attack. However, we show that the national brand manufacturer's ability to charge a two-part tariff erodes as the retailer is able to carry better substitutes of the national brand.

Behind most of our results is the fact that private labels increase the bargaining power of retailers *vis à vis* national brand manufacturers. When retailers carry a private label that is a closer imitation of the national brand, they have better profit opportunities in cases where negotiations do not lead to a beneficial agreement to sell the national brand. This reasoning suggests that retailers will be more interested in introducing a private label to counteract high national brand manufacturer bargaining power by decreasing the manufacturer's incremental contribution to the vertical structure when they can sell a private label that is a closer substitute of the national brand.

We believe that the possibility of having different degrees of competition at the retail level may be a good venue for further research regarding the effects of private label introductions. Another fruitful area of future research is to combine different degrees of competition at the retail level with different degrees of competition at the national brand manufacturer's level. In several real-life situations there is more than one national brand competing with private labels and then, it

may be necessary to re-evaluate the results of such a situation. Finally, if producing private labels of better quality means making same irreversible investments, they may also be modelled as barriers to entry, affecting the concentration of the retail market.

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