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Common Labels and Market Mechanisms

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Abstract

In this article, the impact of common labels is investigated with both theoretical and empirical approaches. Recent statistics regarding the egg market in France suggest that retailer brands largely adopt common labels. A simple theoretical framework enables us to determine the conditions under which producers and/or retailers with different product qualities decide to post a common label on their products. In particular, a situation of multiple equilibria (one where the label is used by the high-quality seller only and one where it is used by the low-quality seller only) is exhibited when the cost of the label is relatively large. The demand is then estimated for different segments of the French egg market, including producer/retailer brands with/without common labels. The estimates are used to derive expenditure and price elasticities and allow us to calculate welfare measures revealing a relatively large willingness-to-pay for labels.

Keywords: competition, demand estimation, labels, product differentiation.

1 Introduction

Product differentiation and quality/characteristic revelation are now widespread in agricultural markets. While a private brand belongs to a single firm (manufacturer/retailer), common labels are used by several producers/firms complying with the label rules and/or having a common characteristic that is not particular to one product. Common labels recently flourished in Europe and in the U.S. (McCluskey and Loureiro, 2003). Consumers face a plethora of food labels concerning safety, freshness, nutrition, characteristics, geographic origin, organic status (...), or respect of the environment and fair trade (...), just to name a few. These characteristics cannot be captured by a single producer/firm, which leads to complex strategies of common labeling as a tool of promotion.

The common label proliferation may lead to confusion among consumers regarding the label signification (Crespi and Marette, 2003). For example, Loisel and Couvreur (2001) show that in France official signals of quality are not clear to many consumers. The recognition of quality labels by French consumers is only 43% for Label Rouge (supposed to indicate a high level of quality), 18% for Agriculture Biologique (organic) and only 12% for Appellations d'Origine Contrôlée (geographic indications). One major problem is simply the legibility and clarity of a label, especially one showing some official seal. Although Label Rouge is a well-established label, which suggests that reputation matters, the fact that less than half of French consumers recognize it is suggestive of the problems inherent in any label. This raises the issue of the effects of common labels on consumers' willingness-to-pay and market prices. The price difference between products with and without labels is one possible (and imperfect) indicator that may be used for measuring the quality perception of consumers and the label reputation.

As the following empirical examples suggest, there is no simple conclusion regarding the impact of labels on market mechanisms. For instance, premium and market valuation

of environmental attributes have been estimated by numerous papers, including Blend and van Ravenswaay (1999), Nimon and Beghin (1999), Teisl *et al.* (1999), and Loureiro *et al.* (2001). In general, these studies show that while very few consumers are ready to pay more than 5-10% more compared to the price of a standard product, the niche eco market is likely a stable one even if it is small.

Another complex example is the role of geographic indications that Hayes and Lence (2005, p. 1) consider as "the only market based solution to the U.S. rural development problem that we are aware of".[1] Loureiro and McCluskey (2000) show that the label of origin for fresh meat in Spain leads to price premia for medium quality. Roosen *et al.* (2003) also suggest that consumers place more importance on labels of origin as opposed to private brands for beef, although this study is applied to European consumers facing the mad cow disease, for which regional labels take on a highly significant meaning.[2] Hassan and Monier (2004) show that various labels matter to French consumers. Based on a hedonic approach, they exhibit a significant price premium for French official labels such as Label Rouge, organic appellation or geographic indications, with a higher premium for retailer brands than for producer brands. Conversely, Bonnet and Simioni (1999) show that French consumers do not value the quality signal provided by the Protected Designation of Origin for Camembert cheese. In this particular case, the brand appears to be the relevant signal.[3]

[1] Even if indications of origin are less used in the U.S. than in Europe, U.S. farmers are also concerned by this tool. In the U.S., it is possible to mention the Washington Apple Label, the Arizona Grown Label, or the Food Alliance Label for Sustainable Agriculture (...) (McCluskey and Loureiro, 2003), while beef producers in Iowa try to develop the Iowa-80 label (Hayes and Lence, 2002, and Hayes *et al.*, 2004).

[2] Enneking (2004) shows that safety labeling significantly influences consumers willingness-to-pay for meat.

[3] Wine is a good example of the appellation proliferation. Peri and Gaeta (1999) provide interesting statistics about the number of (voluntary) labels and appellations in Europe indicating that such a proliferation may be a reality. For instance, they count more than 400 official appellations in the wine sector in Italy alone, a profusion that insures the product diversity but certainly increases the buyer's confusion (see Consumer Reports, 1997). Indeed, wine producers in Australia, California, Chile, and

The results of these previous contributions highlight the complexity of market mechanisms. However, some questions often remain overlooked in this literature. First, who does adopt a common label? Second, what is the consumers' willingness-to-pay for a common label, conditioning its adoption by one or several firms? This article aims at replying to these questions and leads to the following results.

First, some empirical facts regarding the egg market in France are analyzed. The statistics show that the market share of retailer brands with labels largely increased between 1996 and 2002. As, to a lesser extent, the market share of producer brands with common labels also increased, we turn to a theoretical model that enables us to understand both incentives and strategic interactions among producers/retailers for using a common label.

Second, a simple framework allows us to determine the conditions under which sellers with different product qualities (representing the differences between producer and retailer brands) decide to post a common label on their products. The complex interactions between common labeling and competition are emphasized. In particular, a situation of multiple equilibria (one where the label is used by the high-quality seller only and one where it is used by the low-quality seller only) is exhibited when the cost of the label is relatively large. We then turn to an econometric analysis that is useful for quantifying the value that consumers are ready to pay for a label.

Third, we estimate the demand for different segments of the French egg market, including producer/retailer brands with/without common labels. The estimates are used to derive expenditure and price elasticities, and allow us to calculate welfare measures (see Banks *et al.*, 1996). We show that expenditure and price elasticities for segments delineated by the presence or the absence of labels are both statistically significant and different from one another. Eventually, a relatively large willingness-to-pay for labels is exhibited from the computation of equivalent variations. The equivalent variation is a

other emerging wine producing countries are challenging the Appellation of Origin European leadership in world markets (Marsh, 2003).

more complete measure than the consumers' premium for labeled products compared to products without any sign (as proposed in numerous papers), since it takes into account both consumers' preferences and substitutions among various qualities. All these results suggest that information and labels matter to French consumers and explain the price differentiation.

The paper is organized as follows. Section 2 introduces the data and some empirical facts regarding the egg market in France. Section 3 develops the theoretical framework detailing the common label adoption by producer(s). In section 4, the demand for eggs in France is estimated. Section 5 concludes.

2 The Egg Market in France

This section introduces some empirical facts characterizing the egg market in France. Before reporting some descriptive statistics, the data (also used in section 4) are presented.

The data we use are drawn from the 1993, 1996, 1999 and 2002 issues of a French survey conducted by the *Société d'Etude de la Consommation, Distribution et Publicité* (SECODIP). This survey contains detailed information on the attributes of households living in France and on their purchase behavior regarding various consumption goods, including numerous food products.[4] Each issue provides, over the whole year, a description of the main characteristics of the goods, the purchased quantities and the corresponding expenditures. Unit prices are computed as the ratio of expenditures on purchased quantities (namely, the number of eggs).

Respectively to the 1993, 1996, 1999 and 2002 issues, our four initial samples contain 3381, 4355, 5255 and 5362 households. We focus on households that are consumers of eggs sold in boxes. We aggregate weekly or daily expenditures by quarters in order to

[4] The sample only considers households of the 21 regions in metropolitan France without taking into account (*i*) those living in Corsica and France's overseas departments and territories, and (*ii*) single men for the 1993 sample only.

avoid the problem of purchase infrequency. After the exclusion of eggs sold in bulk, and the deletion of incomplete records and of households who did not buy eggs in boxes during a quarter, we end up with final samples containing respectively 1704, 2511, 3007 and 3072 households, and 6816, 10044, 12028 and 12288 observations (coming from per-quarter aggregate values). Observations are then classified and aggregated according to whether or not a brand and/or a common label are observed. We distinguish between producer (or manufacturer) brands and retailer brands. The selected characteristics referring to common labels for eggs are organic, farm (namely, eggs coming from a free-range layer) or open air characteristics, along with eggs for which the laying date is clearly indicated.[5]

Eventually, observations are regrouped into five categories or segments: Producer Brand with a Label (PBL), Retailer Brand with a Label (RBL), Producer Brand with No Label (PBNL), Retailer Brand with No Label (RBNL), and No Brand No Label (NBNL).[6] The number of distinct products composing each of these five segments is given in table 1. In 1996, labels concerned less than 30% of the total number of distinct products observed in the data versus more than 37% in 2002. One explanation of the label attraction is the price difference between products with and without labels. Figure 1 reports the evolution of average-unit prices (in euro) over the period.

Figure 1 indicates that eggs are more expensive when they are sold under a producer brand rather than a retailer brand. Prices are higher for eggs with common labels than for eggs without labels, the gap becoming more important over the end of the decade. Average prices increased from at least 3 cents for products with common labels (from 0.19 and 0.16 in 1993 to 0.23 and 0.19 in 2002 for producer and retailer brands, respectively), while they remained almost constant for the others. Clearly, there is a premium

[5] The laying date is considered as a common label since it is voluntary information that depends on a producer's choice. This differs from the use-by date that is mandatory information provided to consumers.

[6] The sixth group of eggs with a label and without brand is not taken into account because of the very small number of observations.

associated with common labels for both producer and retailer brands. This premium is larger for producer brands than for retailer brands.[7] In 2002, the per-unit premium induced by labels is $0.23-0.15 = 0.08$ euro for producer brands and $0.19-0.14 = 0.05$ euro for retailer brands. Given that the number of eggs with labels purchased by a household over a whole year is on average 33 for producer brands and 67 for retailer brands in 2002, the per-year value generated in 2002 by labels is on average $33 \times 0.08 + 67 \times 0.05 = 6$ euros per household.

The evolution of the cumulated average budget shares between 1993 and 2002 is presented in figure 2. The budget share of eggs with common labels increased from less than 20% in 1993 to more than 50% in 2002. This increase mainly comes from the development of retailer brands with labels. Figures 1 and 2 clearly show that common labels lead to better prices and market shares. These two figures suggest that labels matter for market segmentation and competition among producers.

The point at issue is to determine why retailers (and, to a lower extent, producers) largely adopt common labels. The following section helps to reply to this question by giving clues about the strategic interactions between sellers for joining a common label. For simplicity, the theoretical model imposes two simplifying assumptions compared to the previous description of the egg market. First, we consider only one producer with high-quality products and one producer with low-quality products. As, in figure 1, eggs are more expensive when they are sold under a producer brand rather than a retailer brand; the high-quality producer represents a producer brand while the low-quality producer represents a retailer brand. Second, we introduce a single common label available for both producers, while several common labels coexist on the egg market. Despite these simplifying assumptions, we believe that the theoretical framework brings about interesting insights.

[7] This result differs from the results provided by Hassan and Monier (2004).

3 A Simple Model of Common Labeling

The classical models of product differentiation do not pay attention to the role of a common characteristic/label that can be used by one or several producers. This section underscores the complexity of the strategic interactions related to common labeling between two producers offering different qualities.

3.1 Theoretical Framework

Our model is a simple but useful framework allowing for various extensions. Trade occurs in a single period, with one producer offering high-quality products and one producer offering low-quality products. Let k_h and k_ℓ respectively denote the specific level of high and low quality with $k_h \geq k_\ell$. We assume that the production cost is the same for every producer and is equal to zero for simplicity. Each producer may also choose whether or not to post a common label signaling a characteristic s. It is assumed that only a single common label is able to provide credible and perfect information about the presence of the characteristic s to consumers.[8] Each producer incurs a fixed cost C for the choice of the common characteristic signaled by the common label.[9] The fixed cost comprises the producer's effort necessary for complying with the label requirements along with the cost of the certification process that perfectly signals the characteristic s. The value $I_i = 1$ corresponds to the decision by the producer with products of quality i to select the common characteristic s, while the value $I_i = 0$ corresponds to the opposite decision. The specific quality of each commodity k_h and k_ℓ (related to a brand reputation) and the choice I_i regarding the common characteristic s validated by the common label are perfectly known to all sellers and buyers when prices and purchasing decisions are taken.

Buyers want to purchase only one unit of the good (see Mussa and Rosen, 1978). For

[8] For simplicity, we voluntary abstract from the label proliferation that may lead to confusion among consumers.

[9] Marette *et al.* (1999) and Crespi and Marette (2001) detail the organization of the certification process that provides information to consumers.

a buyer, the indirect utility is equal to $\theta k_h + \lambda_h I_h s - p_h$ for the purchase of a high-quality unit and to $\theta k_\ell + \lambda_\ell I_\ell s - p_\ell$ for the purchase of a low-quality unit. In this indirect utility, p_h and p_ℓ are the respective prices of high- and low-quality products. Regarding specific qualities k_h and k_ℓ, buyers differ in tastes which are described by a uniformly distributed parameter $\theta \in [0, 1]$. The taste parameters for the common label are λ_h for high-quality products and λ_ℓ for low-quality products. For the sake of simplicity and without loss of generality, the mass of consumers is normalized to unity.

A two-stage oligopoly model is considered. In stage 1, each producer chooses either to adhere to the common label ($I_i = 1$), or to avoid the common label ($I_i = 0$). In stage 2, the two producers simultaneously select a price (*i.e.*, Bertrand competition) and buyers purchase units. In this model, producers' decisions are solved by backward induction (*i.e.*, subgame perfect Nash equilibrium). When a producer adheres to the common label, it takes into account the way the other producer adjusts its common labeling and price decisions.

3.2 Producers' decisions

The Bertrand-price equilibrium (in stage 2) is detailed in the appendix. In stage 1, the incentive for a producer to join the common label and to certify the presence of the characteristic s balances two opposite effects. The common label leads to a better price for a producer via an increase of the consumers' willingness-to-pay depending on the value of s. However, this positive effect may be offset by the fixed cost C induced by the common label. The complex effects coming from the choice of joining a common label in a competitive context are now presented. The incentives and the resulting equilibrium in stage 1 are also detailed in the appendix.

The following proposition asserts when the producer of high-quality products and/or the producer of low-quality products individually join the common label. Figure 3 illustrates the market equilibria detailed in proposition 1, where the X-axis represents the characteristic s signaled by the common label and the Y-axis represents the certification

cost C. The relative values of s and C determine the sellers' optimal strategy and define the limits of areas 1 to 5 (the frontiers of these regions are detailed in the appendix). First, it is assumed that $\lambda_h < \lambda_\ell$ in figure 3, which means that consumers have a higher willingness-to-pay for the common label posted on low-quality products than for the one posted on high-quality products. Below, we present the proposition and provide an intuitive interpretation, leaving the mathematical proof in the appendix.

Proposition 1: *The common label is*
(a) not selected in area 1,
(b) selected by the producer of high-quality products in area 2,
(c) selected by both producers whatever the quality of the products in area 3,
(d) selected either by the producer of high-quality products or by the producer of low-quality products in area 4. There is a multiplicity of equilibria, namely two possible equilibria,
(e) selected by the producer of low-quality products in area 5 and 5'.
Proof is given in the appendix.

The certification cost C compared with the marginal gains to use common labels determines the producers' incentives. When the cost C is relatively large compared to the common characteristic s, the absence of common labeling for all producers is optimal. This is the case in region 1 where profits are augmented simply by avoiding the common label. Unlike region 1, in regions 2, 3, 4, 5 and 5' as the characteristic s increases, the common label is attractive because the cost C is now affordable. Notice that the frontier for region 1 is positively sloped with the trade-off between a higher cost and a higher characteristic s leading to a higher willingness-to-pay and higher profits.

In regions 2, 3, 4, 5 and 5', at least one producer chooses the common label since a relatively large characteristic s provides a sufficient incentive. As producers are heterogeneous in their profits due to their quality differences k_h and k_ℓ, the incentives for

using the common label are different. For a same label strategy ($I_h = I_\ell$), the profit with high-quality products is higher than the profit with low-quality products. In region 2, only the producer of high-quality units uses the common label, since a relatively large profit allows the producer to incur a relatively medium cost C compared to the characteristic s. The producer of low-quality products does not obtain enough profit to cover the cost. In area 3, the cost C is relatively low, which explains why the competitive pressure leads both sellers to use the common label. Competition and common label are compatible in area 3.

In area 4, both producers are interested in using the common label since s is relatively large. However, the relatively large cost C compared to the profits only allows its use by one producer. This results in multiple equilibria, one where the label is adopted by the producer of high-quality products only and one where it is adopted by the producer of low-quality products only. In areas 5 and 5', only the producer of low-quality products uses the common label.[10] This result only holds for $\lambda_h < \lambda_\ell$, which means that consumers have a higher willingness-to-pay for the common label posted on low-quality products than for the one posted on high-quality products. As the yield is larger for low-quality products than for high-quality products, only the low-quality producer has the incentive to cover the fixed cost C. Areas 5 and 5' disappear when $\lambda_h = \lambda_\ell$, which is the case in figure 4.

A comparative-static analysis may provide a clue about the decision(s) sensitivity concerning certain parameter shifts. As the parameter λ_h increases, frontiers C_1 and C_3 move apart while frontiers C_2 and C_4 move closer (explaining the difference between figures 3 and 4): region 2 becomes wider, region 4 becomes smaller and shifts towards the East, and regions 5 and 5' disappear as in figure 4. When λ_h is much larger than λ_ℓ, area 4 disappears from figure 4.

Despite simplifying assumptions, the interesting insights of figures 3 and 4 provide

[10] This result is relatively close to the one presented by Hollander *et al.* (1999) under different assumptions. Note that it is limited to areas 5 and 5' in figure 3.

partial explanations for understanding the complex incentives suggested by the interpretation of figure 2. When the cost C is relatively large, the number of producers that may use the common label is limited. Recall from the previous section that we assumed a high-quality producer representing a producer brand and a low-quality producer representing a retailer brand. The analysis can be easily extended to n_h high-quality (producer) brands and n_ℓ low-quality (retailer) brands under a Cournot competition. The larger the number of sellers on one quality segment, the lower the incentive for using the common label since the profits are low compared to the fixed cost C. However, a decrease of C and/or an increase of λ_ℓ may help to explain the increase of the budget share of retailer brands with a label (RBL) from 1993 to 2002 in figure 2.

In defining the analytical framework, very restrictive assumptions were made. The case with a very large s could lead to the elimination of products without common labeling. The basic model could be extended to differential marginal costs reflecting the two quality levels, and then to several different levels of quality. Future analysis could also extend this model to allow for the case where buyers have imperfect information about the characteristic s due to imperfect certification, or to the case of quality choice (k_h, k_ℓ or s) under imperfect information where sellers may try to avoid or discourage quality improvements or common labeling. We abstracted from the consumers' preferences and surplus. However, the following section considers them for computing the willingness-to-pay for a common label.

4 An Empirical Estimation for Measuring Market Effects and Label Value

The empirical estimation completes the previous theoretical model for understanding market mechanisms. We now turn to the description of the methodology.

4.1 Methodology

The demand model that we estimate is the Quadratic Almost Ideal Demand System (QUAIDS) introduced by Banks *et al.* (1997). In this model the budget share w_i^h on good $i = 1, ..., N$ for household $h = 1, ..., H$ with log total expenditure x^h and the log price N-vector p^h is given by

$$w_i^h = \alpha_i + \gamma_i' p^h + \beta_i (x^h - a(p^h, \theta)) + \lambda_i \frac{(x^h - a(p^h, \theta))^2}{b(p^h, \theta)} + \varepsilon_i^h, \tag{1}$$

with the following non-linear price aggregators:

$$\begin{aligned} a(p^h, \theta) &= \alpha' p^h + \frac{1}{2} p^{h\prime} \Gamma p^h, \\ b(p^h, \theta) &= \exp(\beta' p^h), \end{aligned}$$

where $\alpha = (\alpha_1, ..., \alpha_N)'$, $\beta = (\beta_1, ..., \beta_N)'$, $\Gamma = (\gamma_1, ..., \gamma_N)'$, θ is the set of all parameters, and ε_i^h is an error term. Households' heterogeneity enters the system through the α's, which are modelled as linear combinations of some observed socio-demographic variables. These variables are the number of persons living in the household, the age of the head, and dummy variables indicating the socio-economic status of the head, the presence of a child of less than 16 years old and the presence of at least one car. Seasonal dummies are also introduced.

An attractive feature of the model described in (1) is to be conditionally linear in price aggregators. Estimation using the iterated moment estimator developed in Blundell and Robin (1999) is therefore straightforward. This estimator consists of the following series of iterations: for given values of price aggregators, estimate the parameters by a linear moment estimator, use these estimates to update price aggregators and continue the iteration until numerical convergence occurs. Additivity and homogeneity constraints are imposed within the iterative process, and symmetry restricted parameters are obtained in a second stage using a minimum distance estimator. The endogeneity of total expenditure is controlled for by means of instrumental variables

and augmented regression techniques, using household's income as an instrument. The model is estimated on each dataset separately.[11]

One of the main motivations for estimating demand systems is to derive expenditure and price elasticities. But parameter estimates can also be used to calculate welfare measures (see Banks *et al.*, 1996), in particular regarding some product characteristics such as labels. Two simple welfare measures are given by the compensating and equivalent variations (see Deaton and Muellbauer, 1980, for example). Although these measures are not strictly identical, except in the very special case of quasi-linear preferences, they are not strongly different either. In this article, we focus on the latter. The equivalent variation is the maximum amount a household would be prepared to pay before a price increase in order to be as well off as it would be after the price increase. In other words, it measures the maximum amount a household would be willing to pay to avoid the price change.

Formally, let $x^h = c(u^h, p^h)$ be the cost or expenditure function, which defines the total expenditure level required by household h to obtain the utility level u^h. The equivalent variation for h is given by $c(u_2^h, p_2^h) - c(u_2^h, p_1^h)$, where p_1^h is the current price vector faced by the household, p_2^h is the price vector that set to zero its demand for the goods endowed with the characteristic under consideration (namely, the eggs with labels), and u_2^h is the utility level it would obtain if it was no longer a consumer of these goods, that is if $p^h = p_2^h$. Given that the indirect utility function for the QUAIDS model is of the form

$$\ln v^h = \left[\left(\frac{x^h - a(p^h, \theta)}{b(p^h, \theta)} \right)^{-1} + \lambda(p^h, \theta) \right]^{-1}, \tag{2}$$

with $\lambda(p^h, \theta) = \lambda' p^h$, where $\lambda = (\lambda_1, ..., \lambda_N)'$, and since $c(v_2^h, p_2^h) = c(v_1^h, p_1^h) = x_1^h$ is known, the computation of the equivalent variation only requires determining p_2^h, which then can be introduced in (2) to obtain $v_2^h = v(x_1^h, p_2^h)$ and $x_2^h = c(v_2^h, p_1^h)$.

[11] A full account of the estimation results is available on request from the authors.

4.2 Results for the Egg Market in France

The methodology is applied to the egg market in France, with the data presented in section 2. Using the demand estimates we derive (egg) expenditure and uncompensated own-price elasticities, evaluated at the sample mean point of households' income distribution.[12] All are statistically significant at the 5% level, except (egg) budget elasticities for producer and retailer brands with labels in 1993 and 1996 and for retailer brands without labels in 1999. Figures 5 and 6 report their evolution over the period. Figure 5 shows an overall increase in budget elasticities for eggs with labels (from 0.09 and 0.37 in 1993 to 1.29 and 1.85 in 2002 for producer and retailer brands respectively), and an almost symmetrical decrease for eggs without labels (from 1.33 to 0.45 for producer brands over the whole period, and from 2.30 in 1996 to 0.92 in 2002 for retailer brands). These two opposite trends are strong enough to lead to a reversal in the magnitude of expenditure elasticities: the demands for labels were the least sensitive to budget changes in 1993 but the most sensitive in 2002, the reversal occurring between 1999 and 2002.

Figure 6 indicates significant changes in the price sensitivity. The uncompensated own-price elasticity decreased by almost 0.6 point between 1993 and 2002 (from 1.35 to 0.77) for producer brands with labels and increased by 0.5 point (from 0.93 to 1.44) for retailer brands with labels, whereas values for the other groups were quite stable. This result sharply contrasts with the overall stability that can be observed when eggs are considered as an aggregate, since in this case values only range from -0.77 in 1993 to -0.68 in 2002. Furthermore, it is worth noting that the evolution of own-price elasticities from 1996 looks very similar (despite some differences) for producer and retailer eggs with labels on one hand, and for producer and retailer eggs without labels on the other hand. As this figure is also observed in the case of expenditure elasticities, it suggests that segments delimited by the presence or the absence of labels are relevant competing

[12] Uncompensated cross-price elasticities are also computed but they are not presented here. Many are significant and all are reasonable.

segments on the French egg market.

The average equivalent variation for labels and the quartiles of its distribution are presented in figure 7. Since our data are quarterly, the equivalent variation gives the maximum additional amount a household is willing to pay *per quarter* for eggs with quality labels compared to eggs without labels.[13] The average equivalent variation for labels increased from 2 euros in 1993 (on average about 30% of the budget for eggs in the same year) to more than 9 euros in 1996 (near 100% of the budget), and then remained stable until 2002. This seems to suggest an upper bound for the maximum willingness-to-pay for eggs with labels. Despite this upper bound, values are relatively large compared to the figures provided by the literature.

The values obtained for consumers in quartile Q1 and consumers in quartile Q3 reveal a large difference in the maximum willingness-to-pay after 1996. An examination of the composition of each quartile shows that households in quartile Q3 are those that spend the most on eggs and have the largest income. The increase of equivalent variations in 1996 could be explained by the mad cow disease crisis that occured in February 1996 (Adda, 2001), leading consumers to ask for more details and information regarding the products.

To make sure that previous results are not driven by the way we defined segments, we searched for more details about the type of labels and the demand estimates we used to compute the consumers' surplus. From the 2002 data, it is possible to distinguish between two different quality labels, namely, the organic and the farm labels (*i.e.*, eggs coming from a free-range layer). Therefore we can disaggregate the single label indicator that we used above and construct three groups of eggs: organic, farm and regular. Eggs for which the laying date is the only available indication are now considered as regular eggs and are grouped together with eggs without any label. Moreover, no distinction is made between brands in order to keep a reasonable number of observations in each

[13] Notice that substitutions between segments are accounted for in the computation of equivalent variations.

group. Average budget shares are 0.05 for organic eggs, 0.12 for farm eggs and 0.83 for regular eggs. Estimating model (1) and computing elasticities, we find that expenditure elasticies are 1.98 for organic eggs, 1.49 for farm eggs, and 0.85 for regular eggs, and that uncompensated own-price elasticities are -0.95 for organic eggs, -1.44 for farm eggs, and -0.98 for regular eggs. These values are close to those reported for 2002 in figures 5 and 6.

5 Conclusion

In this paper, we showed that the configuration of the egg market in France regarding common labels changed between 1993 and 2002. Recent statistics give evidence that the market share of retailer brands with labels and, to a lesser extent, the one of producer brands with labels largely increased between 1996 and 2002. This fact raises the issue of the sharing of the label benefits between retailers and farmers, which clearly deserves more attention in future studies.

A simple theoretical framework enabled us to understand the strategic interactions among producers for using a common label and to determine the conditions under which sellers with different product qualities decide to post a common label on their products. We then turned to an econometric analysis where demand was estimated for different segments of the French egg market. The estimates were used to derive expenditure and price elasticities and allowed us to calculate the value that consumers are ready to pay for labels. We showed that expenditure and price elasticities for segments defined by the presence or the absence of labels are both statistically significant and different from one another. A relatively large willingness-to-pay for labels was exhibited from the computation of equivalent variations. All these results suggest that information and labels matter to French consumers and explain the price differentiation.

The methodology is useful for (i) a producer board in charge of industry self-regulation looking for a better understanding of market mechanisms under common

labels, and/or (*ii*) a regulator attempting to monitor the use of labels in a context of label proliferation. Beyond our egg example, our findings might be relevant for various markets and/or countries. However, market mechanisms are complex and possibly market-specific, and the methodology should be replicated before asserting anything about other products using common labels.

References

[1] Adda J. (2001). "Behavior Towards Health Risks: An Empirical Study Using the CJD as an Experiment." University College London, mimeo.

[2] Banks J., Blundell R. and Lewbel A. (1996). "Tax Reform and Welfare Measurement: Do We Need Demand System Estimation." *Economic Journal*, 106 (438): 1227-1241.

[3] Banks J., Blundell R. and Lewbel A. (1997). "Quadratic Engel Curves and Consumer Demand." *Review of Economics and Statistics*, 79 (4): 527-539.

[4] Blend J. and van Ravenswaay E. (1999). "Measuring Consumer Demand for Ecolabeled Apples." *American Journal of Agricultural Economics*, 81 (5): 1072-1077.

[5] Blundell R. and Robin J.M. (1999). "Estimation in Large and Disaggregated Demand Systems: An Estimator for Conditionally Linear Systems." *Journal of Applied Econometrics*, 14 (3): 209-232.

[6] Bonnet C. and Simioni M. (2001). "Assessing Consumer Response to Protected Designation of Origin Labelling: A Mixed Multinomial Logit Approach." *European Review of Agricultural Economics*, 28 (4): 433-449.

[7] Consumer Reports (1997). "Wine Without Fuss." October, 10-16.

[8] Crespi J.M. and Marette S. (2001). "How Should Food Safety Certification Be Financed." *American Journal of Agricultural Economics*, 83 (4): 852-861.

[9] Crespi J.M. and Marette S. (2003). "Some Economic Implications of Public Labelling." *Journal of Food Distribution Research*, 34 (3): 83-94.

[10] Deaton A.S. and Muellbauer J. (1980). *Economics and Consumer Behavior*. New-York: Cambridge University Press.

[11] Enneking U. (2004). "Willingness-to-Pay for Safety Improvements in the German Meat Sector: The Case of the Q&S Label." *European Review of Agricultural Economics*, 31 (2): 205-223.

[12] Hassan D. and Monier S. (2004). "National Brands or Stores Brands: Competition Through Public Quality Labels." Cahier de Recherches, 2004-09, INRA-ESR Toulouse.

[13] Hayes D. and Lence S. (2002). "A New Brand of Agriculture: Farmer-Owned Brand Reward Innovation." *Choices*, Fall, 6-10.

[14] Hayes D. and Lence S. (2005). "Geographic Indications and Farmer-Owned Brand: Why Do the U.S. and E.U. Disagree?" Iowa State University, mimeo.

[15] Hayes D., Lence S. and Stoppa A. (2004). "Farmer-Owned Brands?" *Agribusiness: An International Journal*, 20 (3): 269-285.

[16] Hollander A., Monier S. and H. Ossard (1999). "Pleasures of Cockaigne: A Story of Quality Gaps, Market Structure, and Demand of Grading Services." *American Journal of Agricultural Economics*, 83 (2): 501-511.

[17] Loisel J.P. and Couvreur A. (2001). "Les Français, la Qualité de l'Alimentation et l'Information." Credoc INC, Paris.

[18] Loureiro M. and McCluskey J. (2000). "Assessing Consumer Response to Protected Geographical Identification Labeling." *Agribusiness: An International Journal*, 16 (3): 309-320.

[19] Loureiro M., McCluskey J. and Mittelhammer R. (2001). "Assessing Consumers Preferences for Organic, Eco-Labeled and Regular Apples." *Journal of Agricultural and Resource Economics*, 26 (2): 404-416.

[20] Marette S., Crespi J.M. and Schiavina A. (1999). "The Role of Common Labeling in a Context of Asymmetric Information." *European Review of Agricultural Economics*, 26 (2): 167-178.

[21] Marsh V. (2003). "Australia and US Put Case for New Wine Order." *Financial Times*, January 15.

[22] McCluskey J. and Loureiro M. (2003). "Consumer Preferences and Willingness-to-Pay for Food Labeling: A Discussion of Empirical Studies." *Journal of Food Distribution Research*, 34 (3): 95-102.

[23] Mussa M. and Rosen S. (1978). "Monopoly and Product Quality." *Journal of Economic Theory*, 18 (2): 301-317.

[24] Nimon W. and Beghin J. (1999). "Are Eco-Labels Valuable? Evidence From The Apparel Industry." *American Journal of Agricultural Economics*, 81 (3): 801-811.

[25] Peri C. and Gaeta D. (1999). "Designations of Origins and Industry Certifications as Means of Valorising Agricultural Food Products." In *European Agro-Food System and the Challenge of Global Competition*, Ismea, Milano, Italy.

[26] Roosen J., Lusk J.L. and Fox J.A. (2003). "Consumer Demand for and Attitudes Toward Alternative Beef Labeling Strategies in France, Germany, and the UK." *Agribusiness: An International Journal*, 19 (1): 77-90.

[27] Teisl M., Roe B. and Levy A. (1999). "Ecocertification: Why It May Not Be A 'Field of Dreams'." *American Journal of Agricultural Economics*, 81 (5): 1066-1071.

[28] Westgren R. (1999). "Delivering Food Safety, Food Quality, and Sustainable Production Practices: The Label Rouge Poultry System in France." *American Journal of Agricultural Economics*, 81 (5): 1107-1111.

Appendix

Consumers' demand and sellers' profits are presented before detailing the proof of proposition 1.

The consumer with utility $\theta k_\ell + \lambda_\ell I_\ell s - p_\ell = 0$ is indifferent between buying and not buying a low-quality product, implying that his taste parameter $\widetilde{\theta} = \frac{p_\ell - \lambda_\ell I_\ell s}{k_\ell}$. The consumer implicit in $\theta k_h + \lambda_h I_h s - p_h = \theta k_\ell + \lambda_\ell I_\ell s - p_\ell$ is indifferent between buying high-quality and buying low-quality, yielding a taste parameter $\widehat{\theta} = \frac{p_h - p_\ell + s(\lambda_\ell I_\ell - \lambda_h I_h)}{k_h - k_\ell}$. As the distribution of preferences is uniform, the demand for high-quality products is $Q_h = 1 - \widehat{\theta}$ and the demand for low-quality products is $Q_\ell = \widehat{\theta} - \widetilde{\theta}$.

In stage 2, each producer chooses a level of price, taking into account the price of the other producer. The profit for the high-quality seller is $\pi_h = p_h Q_h - I_h C$ and the profit for the low-quality seller is $\pi_\ell = p_\ell Q_\ell - I_\ell C$. The first order conditions for the maximization of π_h with respect to p_h (namely, $\partial \pi_h / \partial p_h = 0$) and π_ℓ with respect to p_ℓ (namely, $\partial \pi_\ell / \partial p_\ell = 0$) lead to equilibrium prices p_h^* and p_ℓ^*. The substitution of these equilibrium prices into π_h and π_ℓ leads to the following respective profits for the seller of high-quality products and for the seller of low-quality products:

$$\pi_h(I_h, I_\ell) = \frac{\left[k_h\left(2k_h + s(2\lambda_h I_h - \lambda_\ell I_\ell)\right) - k_\ell(2k_h + s\lambda_h I_h)\right]^2}{(4k_h - k_\ell)^2(k_h - k_\ell)} - I_h C, \tag{3}$$

$$\pi_\ell(I_h, I_\ell) = \frac{k_h\left[2k_h\lambda_\ell I_\ell s - k_\ell^2 + k_\ell(k_h - s(\lambda_h I_h + \lambda_\ell I_\ell))\right]^2}{k_\ell(4k_h - k_\ell)^2(k_h - k_\ell)} - I_\ell C. \tag{4}$$

The decision to use the common label in stage 1 depends on these profits. In figures 3 and 4, we assume that $p_h^* > p_\ell^*$ under $I_\ell = 1$ and $I_h = 0$. We also assume that both qualities are always sold. In particular, this is the case for $I_\ell = 0$ and $I_h = 1$, if $Q_\ell = \widehat{\theta} - \widetilde{\theta} > 0$, which is the case for $s < (k_h - k_\ell)/\lambda_h$.

In stage 1, each producer faces the following decision: (i) join the common label ($I_i = 1$) and incur the cost C, or (ii) avoid the common label ($I_i = 0$). For the high-quality producer, the decision depends on the comparison between $\pi_h(1, I_\ell)$ that

denotes the profit under the common label, and $\pi_h(0, I_\ell)$ that denotes the profit under the absence of common labeling. For the low-quality producer, the decision depends on the comparison between $\pi_\ell(I_h, 1)$ that denotes the profit under the common label, and $\pi_\ell(I_h, 0)$ that denotes the profit under the absence of common labeling. We now turn to the equilibrium strategies that lead to proposition 1.

Proof of proposition 1.

The different areas of figure 3 correspond to one or two configurations of equilibrium. We now present the different configurations.

(a) No producer uses the common label when

$$\begin{aligned} \pi_h(1,0) &< \pi_h(0,0), && (5)\\ \text{and } \pi_\ell(0,1) &< \pi_\ell(0,0). && (6) \end{aligned}$$

Using (3) and (4), this system is satisfied in area 1 of figure 3 where

$$\begin{aligned} C &> C_1 = \frac{\left[2k_h\left(k_h + s\lambda_h\right) - k_\ell(2k_h + s\lambda_h)\right]^2 - \left[2k_h^2 - 2k_hk_\ell\right]^2}{(4k_h - k_\ell)^2(k_h - k_\ell)},\\ \text{and } C &> C_2 = k_h\frac{\left[2k_h\lambda_\ell s - k_\ell^2 + k_\ell(k_h - s\lambda_\ell)\right]^2 - \left[k_\ell k_h - k_\ell^2\right]^2}{k_\ell(4k_h - k_\ell)^2(k_h - k_\ell)}. \end{aligned}$$

(b) The producer of high-quality products uses the common label when

$$\begin{aligned} \pi_h(1,0) &\geq \pi_h(0,0), && (7)\\ \text{and } \pi_\ell(1,1) &< \pi_\ell(1,0). && (8) \end{aligned}$$

Using (3) and (4), this system is satisfied in areas 1 and 4 of figure 3 where

$$\begin{aligned} C &\leq C_1,\\ \text{and } C &> C_3 = k_h\frac{\left[2k_h\lambda_\ell s - k_\ell^2 + k_\ell(k_h - s(\lambda_h + \lambda_\ell))\right]^2 - \left[k_\ell(k_h - s\lambda_h) - k_\ell^2\right]^2}{k_\ell(4k_h - k_\ell)^2(k_h - k_\ell)}. \end{aligned}$$

(c) Both producers use the common label when

$$\begin{aligned} \pi_h(1,1) &\geq \pi_h(0,1), && (9)\\ \text{and } \pi_\ell(1,1) &\geq \pi_\ell(1,0). && (10) \end{aligned}$$

Using (3) and (4), this system is satisfied in area 3 of figure 3 where

$$\begin{aligned} C &< C_4 = \frac{[k_h\,(2k_h + s(2\lambda_h - \lambda_\ell)) - k_\ell(2k_h + s\lambda_h)]^2 - [k_h(2k_h - s\lambda_\ell - 2k_\ell)]^2}{(4k_h - k_\ell)^2(k_h - k_\ell)}, \\ \text{and } C &< C_3. \end{aligned}$$

(e) The producer of low-quality products uses the common label when

$$\pi_h(1,1) < \pi_h(0,1), \tag{11}$$

$$\text{and } \pi_\ell(0,1) > \pi_\ell(0,0). \tag{12}$$

Using (3) and (4), this system is satisfied in areas 4, 5, and 5' of figure 3 where

$$\begin{aligned} C &> C_4, \\ \text{and } C &< C_2. \end{aligned}$$

(d) In area 4, two equilibria exist simultaneously, one in which only the producer of high-quality products uses the common label (namely, conditions (7) and (8) hold) and one in which only the producer of low-quality products uses the common label (namely, conditions (11) and (12) hold).

The difference between figure 3 and figure 4 comes from the relative values of λ_h and λ_ℓ. When $\lambda_h < \lambda_\ell$, it is easy to show that $C_2 > C_1$ and $C_3 > C_4$, which leads to the existence of areas 5 and 5' (figure 3). When $\lambda_h = \lambda_\ell$, it is easy to show that $C_2 < C_1$ and $C_3 < C_4$, which leads to the absence of areas 5 and 5' (figure 4). When $\lambda_h > \lambda_\ell$, it is easy to show that $C_2 < C_4$, which leads to the absence of area 4 (and areas 5 and 5'), a situation that is not represented in this paper.

□

Table 1. Number of distinct products

	1993	1996	1999	2002
PBL	NA	84	101	104
RBL	NA	20	28	31
PBNL	NA	255	211	174
RBNL	NA	31	24	20
NBNL	NA	52	41	30

Figure 1. Average unit prices (euros)

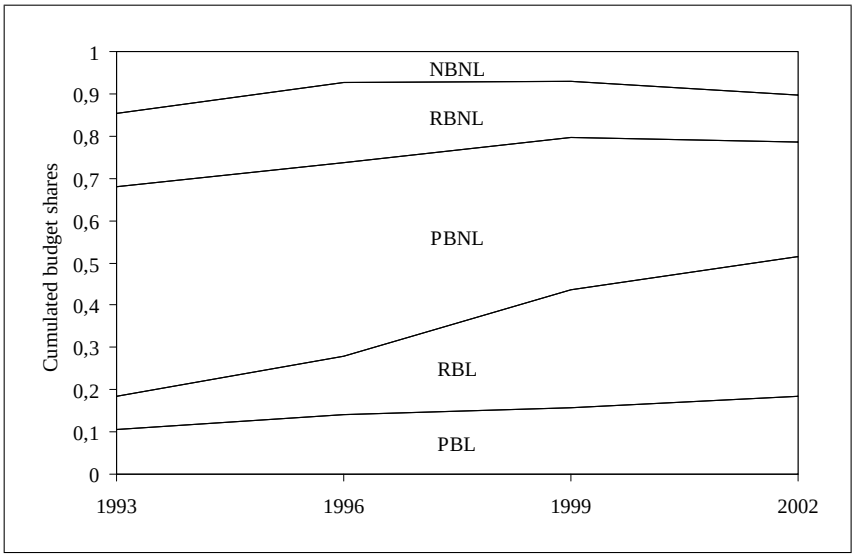

Figure 2. Cumulated budget shares

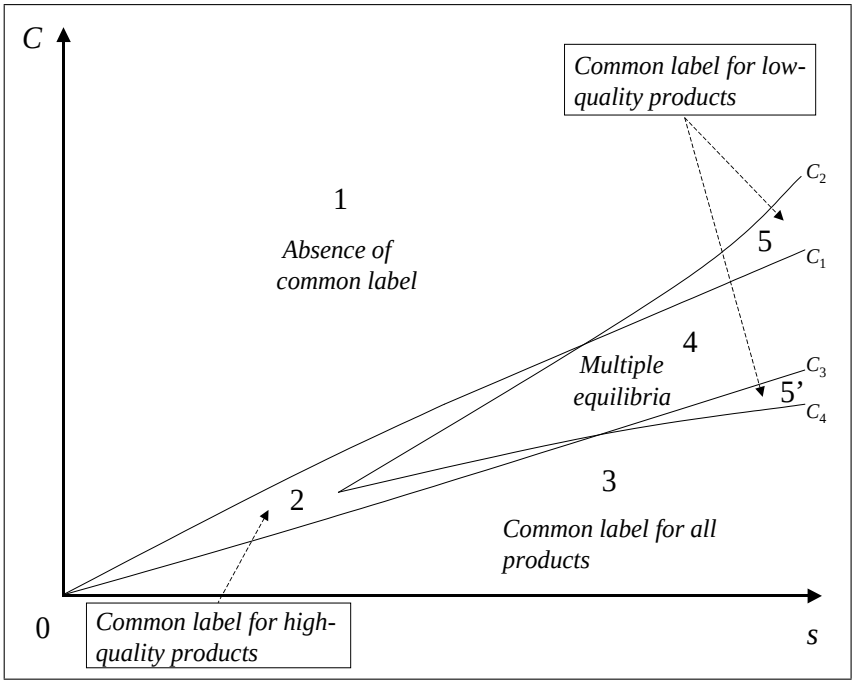

Figure 3. Common label choice for $\lambda_h < \lambda_\ell$

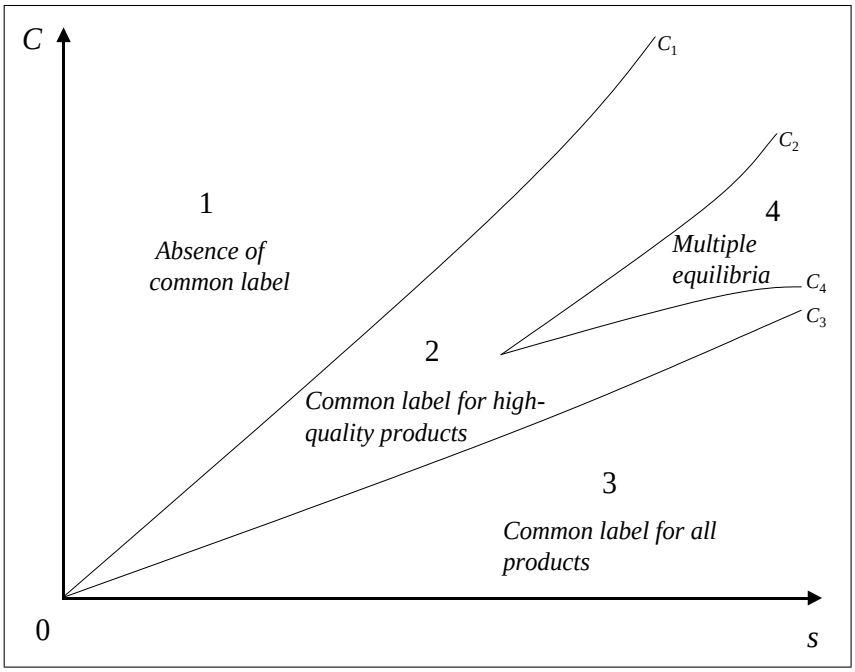

Figure 4. Common label choice for $\lambda_h = \lambda_\ell$

Figure 5. Expenditure elasticities

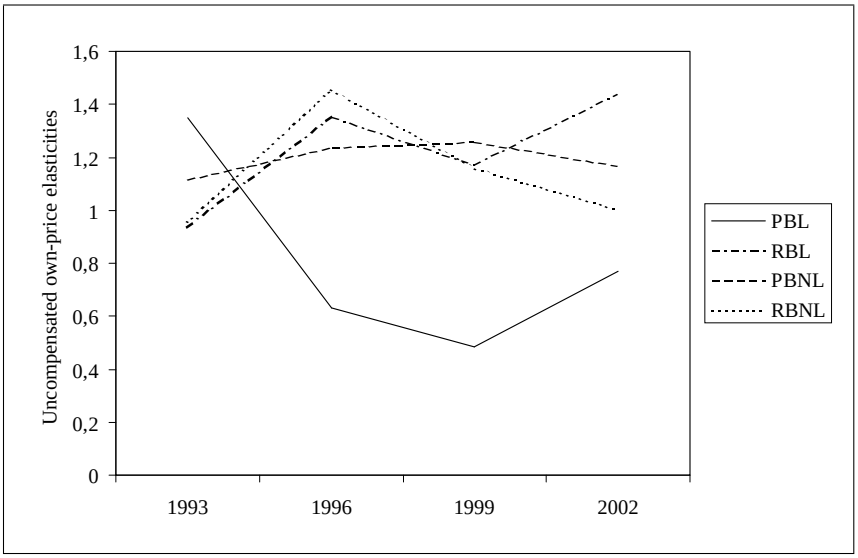

Figure 6. Own-price elasticities (absolute values)

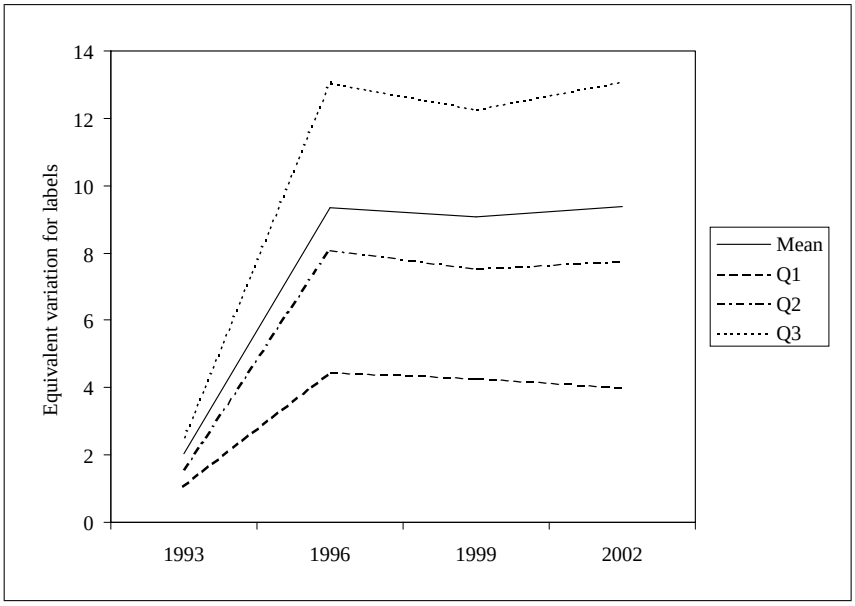

Figure 7. Equivalent variation for labels (euros)