The official quality signs influence on prices and volumes: the case of organic fresh eggs

Abstract: The use of organic official quality sign is growing for animal products production in France. Past researches have assessed the market performance of organic using attitudinal data. This paper investigates the impact of organic label on market performance using real market data. We use the hedonic price formation to understand the value of organic and the influence of store types in price formation. To complete the understanding of the organic official quality sign in the market, we calculate the price elasticity of organic among the other egg marks. Our results reveal a positive trend for higher quality products, and that core organic consumers are not price-sensitive, which increase market performance. This effect is mitigated by the store type which commercializes the organic product, highlighting the importance of the interaction between the two quality signals.

Key words: organic label, performance, price, market, store

L'influence du label Bio sur les prix et les ventes : Le cas des œufs

Résumé: L'utilisation du signe officiel de qualité AB (agriculture biologique) est grandissante dans la production de produits animaux. Les recherches en marketing visant à mesurer les performances de marché du bio sont principalement basées sur des études déclaratives et hypothétiques. Fondées sur des données réelles de marché, l'objet de cette étude est d'analyser la performance de marché du label Bio. La méthode des prix hédoniques permet de définir la valeur de la caractéristique biologique du produit dans la formation des prix, ainsi que l'influence du type de distributeur. Pour compléter notre étude, une analyse de l'élasticité prix des produits bio par rapport aux autres marquages a été effectuée. Les résultats révèlent d'une part une hausse des ventes de produits de haute qualité, et d'autre part, un profil de consommateurs de produits Bio peu sensibles aux variations de prix. Ces deux tendances augmentent la performance du marché Bio. Cet effet est atténué par le type de distributeur qui commercialise le produit bio, mettant en lumière l'importance de l'interaction entre les deux signaux de qualité.

Mots clefs: label Bio, performance, prix, marché, type de distributeurs

Introduction

The intensification of animal products production required new policies regarding animal production diseases, sustainable intensification and animal welfare which incorporate consumer new priorities. Thereby, the table eggs are all marked according to an official marking system managed by a European directive concerning registration of establishments keeping laying hens (The commission of the european communities, 2002) (appendix 1). Each mark and official quality sign (OQS) (Organic and Label Rouge) dovetails with a production method whose ethics is assessed by consumers, according to their interests, lifestyle, opinions and attitudes (Funk & Phillips, 1990). Over the last decades, the organic production shows an exponential growth rate, especially for animal products. In France, the laying hens are the second sector with the highest part of organic production (10,1% in 2017) (« Chiffres de la bio en France - Agence Française pour le Développement et la Promotion de l'Agriculture Biologique - Agence BIO », s. d.).

Literature review

The new consumers concerns grant a higher willingness-to-pay (WTP) (Auger, Devinney, Louviere, & Burke, 2008; Kehlbacher, Bennett, & Balcombe, 2012). As consumers are not able to distinguish the production mode through tasting (Guibert & Victoria, 2010), they essentially focus on in-store information including price ranges, marks, store types and brand types, but also beliefs towards animal welfare, healthcare, environmental and social concerns (Shepherd, Magnusson, & Sjödén, 2005). Eggs are credence goods which quality is signaled by labelling (Roe & Sheldon, 2007; Nelson, 1970). This study contributes to the body of research on the impact of organic label on market results (Katsikeas, Morgan, Leonidou, & Hult, 2016).

The OQS are signals that provides a better information to the consumers about the product, its production process or the company which produces it, and represent marketing levers (Larceneux, 2003). As a brand, the OQS has intangible resource characteristics. According to the resource-based view and more specifically the concept of dynamic capabilities, the competitive advantage of dynamic dimensions of resources "lies in their ability to alter the resource base: create, integrate, recombine, and release resources" (Eisenhardt & Martin, 2000, p. 1116). The marketing actions influences the customer attitude and the market impacts and positions (Hanssens & Pauwels, 2016). The customer behavior toward the price and the volume of purchase is an indicator of the value addressed to the product (Rust, Ambler, Carpenter, Kumar, & Srivastava, 2004).

The organic OQS influences positively the purchase intention and the WTP (Dufeu, Ferrandi, Gabriel, & Le Gall-Ely, 2014; Larceneux, Benoit-Moreau, & Renaudin, 2012; Bernard & Bernard, 2010).

Hypothesis 1: The organic OQS commands a price premium.

Moreover, the store type and its environment influence the organic purchase (Gottschalk & Leistner, 2013; Akaichi, Nayga Jr, & Gil, 2012; Paul & Rana, 2012) The store type and its environment influence the organic purchase (Paul & Rana, 2012). For example, specialized food store are preferred for organic purchasers (Akaichi et al., 2012) and discount store stimulates the organic market (Gottschalk & Leistner, 2013). We investigate the weight of store type in price formation.

Hypothesis 2: The store type influences the organic eggs price premium.

To give a better understanding of the organic OQS effects in terms of price but also sales volumes, we test the price-elasticity. Previous studies have looked at the price-elasticity of organic products, and the results are heterogeneous (Bezawada & Pauwels, 2013; Kiesel & Villas-Boas, 2007). Lower price has a negative impact on consumers purchase, according to a study on French grocery stores (Ngobo, 2011).

Hypothesis 3: The own-elasticity is greater for organic eggs than non-organic eggs.

Data

In order to test our hypotheses, we used two databases using the stated preference method. The first one is a consumer panel conducted by Kantar over 5 years, from January 2012 to September 2017, extracted from France Agrimer (appendix 2). The observation of the data highlights the profitable trend for high quality products including OQS in spite of a largely higher price. The consumers shift away from cage and barn categories.There are monthly mean prices and mean sales volumes for each egg mark.

The second data base (appendix 3) completes the examination of organic profitability in terms of margin according to the store type (appendix 4). At stores, the cheapest organic eggs option is unsurprisingly available in the discount stores. There are weekly mean prices for three store types, namely conventional stores, discount stores and specialized stores (organic stores). We use the standard deviation to indicate the price volatility. We note that the price volatility is small at specialized stores compared to others.

The entire statistic treatment has been realized with the R Studio Software (DevelopmentCoreTeam, 2005).

Study 1. Hedonic price method: the price premium of organic and the store type influence

Our first study is based on the hedonic price function that determines the retail price in the fresh eggs markets. Rosen (1974) defined hedonic prices as "the implicit prices of attributes and are revealed to economic agents from observed prices of differentiated products and the specific amounts of characteristics associated with them". It allows us to estimate the implicit prices of each characteristic that define the nomenclature of table eggs. Differences in price levels between eggs should reflect differences in eggs characteristics. We selected four characteristics that are claimed by the marking system (appendix 5) to elaborate the hedonic price equation: the cage free breading, the free-range breading, the presence of a label, either organic or Rouge, and the organic characteristic. Our extended semi-log model is expressed as:

$$lnP_i = \propto + \beta_1 CF_i + \beta_2 FR_i + \beta_3 OQS_i + \beta_4 OR_i + \varepsilon_i \quad (1)$$

With CF for the cage free characteristic, FR for the free-range characteristic, OQS for the fact that the egg wear an official quality sign whether it is a Label Rouge or an Organic label, and OR for the organic characteristic. Test results suggest the presence of heterosckedasticity; consequently White's heteroskedasticity-consistent standard errors has been used. The model fit the data well with an adjusted R^2 of 0,977.

Table 1 Semi-log hedonic model estimates for marks

	Estimate	*Std.Error*	*t-value*

Constant	2.675197	0.004013	***
Cage-Free	0.101982	0.010627	***
Free-Range	0.375223	0.011673	***
OQS	0.285719	0.00673	***
Organic	0.040087	0.004883	***
Number of Observation	*370*		
Adjusted R²	*0,977*		

Every single characteristic significantly adds value to the product. We tested the multicollinearity by calculating the variance inflation factors, and none were relevant. We notice that the free-range characteristic is the most important in term of market price determination, followed by the presence of an OQS. The organic characteristic does not play a key role according to our results. This confirm the study of Karapidis *and al* (2005) which expressed that free-range is more powerful in price formation than organic. The cage-free characteristic is not as much important as free-range and OQS in price formation, and it confirms the study of Chang, Lusk and Norwood (2010). The price premium for organic is significant, supporting H1. Nevertheless, we temper this result as the organic products has a low coefficient.

Based on the second data base, we investigate the price function of organic eggs according to the implicit prices of store types (Appendix 6). In our equation, the independent variable is the logarithm of the table eggs prices, including organic and non-organic quality. Our extended semi-log model is expressed as:

$$lnP_i = \propto + \beta_1 GMSBIO_i + \beta_2 DISBIO_i + \beta_3 SPE_i + \varepsilon_i \quad (2)$$

The model fits the data well with an adjusted R² of 0,977.

Table 2 Semi-log hedonic model estimates for store types (DevelopmentCoreTeam, 2005)

	Estimate	*Std.Error*	*t-value*
Constant	1.2669528	0.0006801	***
Conventional store	0.2576552	0.0015699	***
Discount store	0.1835961	0.0018538	***
Specialised store	0.2886783	0.0008283	***
Number of Observation	*2690*		
Adjusted R²	*0,977*		

The results confirmed that in any store type, organic quality creates value. We tested the multicollinearity by calculating the variance inflation factors, and none were relevant. Nevertheless, this value is unequal. The weight of specialized stores in organic price formation is the highest, followed closely by the conventional store. The discount store stays positive but is way weaker than others. The price premium for organic eggs is modified according to the store type. Our results support H2, in line with the literature about price premium at conventional stores (Rondán Cataluña, Sánchez Franco, & Villarejo Ramos, 2005).

Study 2. The price-elasticity of organic eggs

We analyze the sales volumes thanks to a log-log functional form that provides direct estimates of the respective elasticity of the independent variables with respect to the dependent variable.

(3)

$$lnY_i = b_0 + b_1 ln(X_1) + b_2 ln(X_2) + b_3 ln(X_3) + b_4 ln(X_4) + b_5 ln(X_5) + b_6 ln(X_{(6)})$$

Where lnY_i is the predicted sales volume, b0 is the model intercept, and all the following factors are price variation for each production methods: b1 for cage production methods, b2 for barn production methods, b3 for Label Rouge production methods, b4 for other free-range production methods, b5 for organic production methods and b6 for no signaled production methods. Barn and no sign categories are not analyzed deeply because of the very small amount of sales volumes they represent.

Table 3 Price elasticity for eggs according to the categories (DevelopmentCoreTeam, 2005)

		Sales' Volumes			
		Cage	Free-range	Label Rouge	Organic
Prices	Cage	X	-0.811**	X	X
	Free-range	X	X	-0,455*	0.239*
	Label Rouge	X	X	X	1.080**
	Organic	X	X	X	X

Note : ***sig < 0,01 ; ** < 0,01 ; *sig < 0,05

This table shows a blatant asymmetrical and heterogeneous elasticity, which confirms that price is not the main concern for consumers. That may be the effect of a lower price premium that the consumer consent to pay to access the higher quality product. In that sense, the organic attribute is valuable for consumers. This support H3. The consumers pay a price premium to accede to the quality of organic eggs in spite of the price. A certain weakness of the Label Rouge is pointed out by the data. Its sales can be negatively impacted by the free-range price. As the Label Rouge quality sign belongs to the free-range category, the free-range without quality sign might be perceived as a substitute of Label Rouge.

Discussion and implications

First, we find that consumers are globally in a social trend that shifts their purchase to high-quality products, regardless of the price. Both hedonic analyses report the implicit prices of organic in eggs price formation and the store type has an influence on the organic price. Although our results give evidence about the organic value creation, we must interpret them with cautious as other criteria may count such as GM-free or local production features.

Second, the price variation investigation reveals a lack of elasticity for organic. Pricing does not affect sales, whereas other high-quality ranges react differently. This confirms the work of Ngobo (2011) which found that consumers tend to stay with organic products rather than shift to another quality. Also, the organic volumes benefit from free-range and Label Rouge price increase. This result confirms the work of Bernard and Bernard (2010, p. 473) which found that a price increase for non-organic products shifts consumers toward the organic version, more than the opposite.

Third, the marking system gives information about a non-commercial attribute (the production process) that enhance the value (Kehlbacher et al., 2012; Auger et al., 2008). Nevertheless, the strength of the organic OQS must come from both process methods and health aspect or other beliefs.

Fourth, lower prices is not a competitive advantage for organics, and increasing may have positive outcomes for organics. The results confirm the work of Ngobo (2011) and Bezawada

and Pauwels (2013): reducing organic prices is ineffective, and increasing non-organic eggs is in favor of organic products. The stores' managers should consider increasing or stabilizing their organic eggs prices. Otherwise, the non-specialized stores must use the low price to attract noncore organic consumers, as a loss-leader product, and benefits from the consumers' traffic in the organic section for creating margins with other products.

Fifth, the organic label acts as an intangible resource that contributes to a market performance (Hooley, Greenley, Cadogan, & Fahy, 2005). The firms employ OQS as a resource to create value, defined as an "additional revenue minus the costs of generating the additional revenue" (McWilliams & Siegel, 2011, p. 1492). We consider the organic OQS as a competitive advantage in the sense that it shifts the consumers in certain case and does not suffer from price increasing. The stores must promote organic products in the hope of margins and store revenues increase.

Finally, our study also has implication for policymakers. The official marking system creates value as it gives better information to consumers. This system may be tested on other agrifood products.

Conclusion

The French egg market witness an impressive growth between 2012 and 2017. Using market metrics instead of consumer metrics, we avoid the biases associated with hypothetical responses and unrealistic scenarios (Breidert, Hahsler, & Reutterer, 2006) and complete the literature on market results of organic label in terms of price and volumes. We assess the market performance through hedonic price and the price elasticity of organic OQS, in order to strive to identify how the organic certification influences value creation. We took into consideration the other marks and the store types to understand better the OQS.

The framework we have proposed assesses the importance of the interaction between the store type and the organic label. Future research must analyzing the congruence with store name, brand equity and other in-store information. The acceptance of a higher price for a higher quality revealed a market advantage for the organic label. The future of organic eggs is bright for specialized stores and must conduct non-specialized stores to modify their strategies to take advantage of this market.

Appendix

Appendix 1 Code for the farming method (The commission of the european communities, 2002)

The farming methods as defined in Regulation (EEC) No 1274/91 and the Regulation (EEC) No 2092/91 shall be indicated by the following code:

Code	Farming methods
0	Organic
1	Free-range (including Label Rouge)
2	Barn
3	Cages

Appendix 2 Sales volumes (%) and price (€/100eggs) evolution for certifications from January 2012 to September 2017 – Rate of change and mean price

		Cage	Barn	Label Rouge	Free-Range*	Organic	No sign
Sales Volumes (%)	*Rate of change*	-22,50%	-45,00%	64,44%	56,21%	55,71%	-4,00%
	September 2017	45,80%	2,20%	7,40%	23,90%	10,90%	9,60%
Price (€)	*Rate of change*	-4,66%	50,82%	2,96%	-4,80%	1,92%	27,08%
	September 2017	13,90€	21,10€	31,00€	23,40€	34,00€	26,00€
Number of observations		*74*	*74*	*74*	*74*	*74*	*74*

*Except the Label Rouge free-range eggs

Appendix 3 Price volatility - variation coefficient of mean prices of the chain - comparison of conventional and organic table eggs

	Non-organic eggs			*Organic eggs*		
	Mean (€)	*Stand. Dev.*	*Nb of observation*	*Mean (€)*	*Stand. Dev.*	*Nb of observation*
Wholesaler	6,86	1,52	*377*	29,35	0,83	*377*
Conventional distributor	17,73	0.83	*377*	31	1.77	*377*
Discount distributor	16,98	0,76	*377*	25,53	1.61	*377*
Organic distributor	X	X	*0*	34,28	0.49	*377*

Appendix 4 Price volatility - variation coefficient of mean prices of the chain - comparison of conventional and organic table eggs

	Non-organic eggs		*Organic eggs*	
	Mean (€)	*Stand. Dev.*	*Mean (€)*	*Stand. Dev.*
Conventional distributor	17,73	0.83	31	1.77
Discount distributor	16,98	0,76	25,53	1.61
Organic distributor	X	X	34,28	0.49

Appendix 5 Descriptive statistics for hedonic price calculation

Variables	*Abbreviations*	*Modalities*	*Descriptive statistics*
Price	Price	Continuous	Mean = 23,53 Sd Dev = 7.46
Egg Type	Type	Cage=1; Barn=2; Free-range=3; Label Rouge=5; Organic=6	45;45;45;45;45
Characteristics			
Cage free breading	CF	Yes=1; No=0	296;74
Free-Range breading	FR	Yes=1; No=0	222;148
Official quality sign	OQS	Yes=1; No=0	148;222
Organic	OR	Yes=1; No=0	74;296

Appendix 5 Descriptive statistics for hedonic price calculation

Variables	*Abbreviations*	*Modalities*	*Descriptive statistics*
Price	Price	Continuous	Mean = 23,53 Sd Dev = 7.46
Organic eggs at			
Conventional store	GMSBIO	Yes=1; No=0	538;2690
Discount store	DISBIO	Yes=1; No=0	538;2690
Specialized store	SPE	Yes=1; No=0	538;2690

Bibliography

Akaichi, F., Nayga Jr, R. M., & Gil, J. M. (2012). Assessing consumers' willingness to pay for different units of organic milk: Evidence from multiunit auctions. *Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie*, *60*(4), 469–494.

Auger, P., Devinney, T. M., Louviere, J. J., & Burke, P. F. (2008). Do social product features have value to consumers? *International Journal of Research in Marketing*, *25*(3), 183-191. https://doi.org/10.1016/j.ijresmar.2008.03.005

Bernard, J. C., & Bernard, D. J. (2010). Comparing parts with the whole: Willingness to pay for pesticide-free, non-GM, and organic potatoes and sweet corn. *Journal of Agricultural and Resource Economics*, 457–475.

Bezawada, R., & Pauwels, K. (2013). What is special about marketing organic products? How organic assortment, price, and promotions drive retailer performance. *Journal of Marketing*, *77*(1), 31-51.

Breidert, C., Hahsler, M., & Reutterer, T. (2006). A REVIEW OF METHODS FOR MEASURING WILLINGNESS-TO-PAY. *Innovative Marketing*, *2*(4), 25.

Chang, J. B., Lusk, J. L., & Norwood, F. B. (2010). The price of happy hens: A hedonic analysis of retail egg prices. *Journal of Agricultural and Resource Economics*, 406–423.

Chiffres de la bio en France - Agence Française pour le Développement et la Promotion de l'Agriculture Biologique - Agence BIO. (s. d.). Consulté 7 novembre 2018, à l'adresse http://www.agencebio.org/la-bio-en-france

DevelopmentCoreTeam, R. (2005). R: A language andenvironmentforstatisticalcomputing, R FoundationforStatistical Computing, Vienna, Austria, ISBN3・900051・07-0, TheR Pr 吋 ectfor StatisticalComputing,(online),< h 句. *www. R-project. or ダ*.

Dufeu, I., Ferrandi, J.-M., Gabriel, P., & Le Gall-Ely, M. (2014). Multi-labellisation socio-environnementale et consentement a payer du consommateur. *Recherche et Applications En Marketing*, *29*(3), 34-55. https://doi.org/10.1177/0767370114527667

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: What are they? *Strategic Management Journal*, *21*(10-11), 1105-1121. https://doi.org/10.1002/1097-0266(200010/11)21:10/11<1105::AID-SMJ133>3.0.CO;2-E

Funk, T. F., & Phillips, W. (1990). Segmentation of the market for table eggs in Ontario. *Agribusiness*, *6*(4), 309–327.

Gottschalk, I., & Leistner, T. (2013). Consumer reactions to the availability of organic food in discount supermarkets. *International Journal of Consumer Studies*, *37*(2), 136–142.

Guibert, F., & Victoria, R. (2010, février). 60 millions de consommateurs. *Tous dans le même panier*, (446), 36-41.

Hooley, G. J., Greenley, G. E., Cadogan, J. W., & Fahy, J. (2005). The performance impact of marketing resources. *Journal of Business Research*, *58*(1), 18-27. https://doi.org/10.1016/S0148-2963(03)00109-7

Karipidis, P., Tsakiridou, E., & Tabakis, N. (2005). Hedonic Analysis of Retail Egg Prices. *Journal of Food Distribution Research*, (36), 6.

Katsikeas, C. S., Morgan, N. A., Leonidou, L. C., & Hult, G. T. M. (2016). Assessing Performance Outcomes in Marketing. *Journal of Marketing*, *80*(2), 1-20. https://doi.org/10.1509/jm.15.0287

Kehlbacher, A., Bennett, R., & Balcombe, K. (2012). Measuring the consumer benefits of improving farm animal welfare to inform welfare labelling. *Food Policy*, *37*(6), 627–633.

Kiesel, K., & Villas-Boas, S. B. (2007). Got Organic Milk? Consumer Valuations of Milk Labels after the Implementation of the USDA Organic Seal. *Journal of Agricultural & Food Industrial Organization*, *5*(1). https://doi.org/10.2202/1542-0485.1152

Larceneux, F. (2003). Segmentation des signes de qualité: labels expérientiels et labels techniques. *Décisions Marketing*, 35-46.

Larceneux, F., Benoit-Moreau, F., & Renaudin, V. (2012). Why might organic labels fail to influence consumer choices? Marginal labelling and brand equity effects. *Journal of Consumer Policy*, *35*(1), 85-104.

McWilliams, A., & Siegel, D. S. (2011). Creating and capturing value: Strategic corporate social responsibility, resource-based theory, and sustainable competitive advantage. *Journal of Management*, *37*(5), 1480–1495.

Nelson, P. (1970). Information and consumer behavior. *Journal of political economy*, *78*(2), 311–329.

Ngobo, P. V. (2011). What Drives Household Choice of Organic Products in Grocery Stores? *Journal of Retailing*, *87*(1), 90-100. https://doi.org/10.1016/j.jretai.2010.08.001

Paul, J., & Rana, J. (2012). Consumer behavior and purchase intention for organic food. *Journal of Consumer Marketing*, *29*(6), 412-422. https://doi.org/10.1108/07363761211259223

Roe, B., & Sheldon, I. (2007). Credence good labeling: The efficiency and distributional implications of several policy approaches. *American Journal of Agricultural Economics*, *89*(4), 1020–1033.

Rondán Cataluña, F. J., Sánchez Franco, M. J., & Villarejo Ramos, A. F. (2005). Are hypermarket prices different from discount store prices? *Journal of Product & Brand Management*, *14*(5), 330–337.

Rosen, S. (1974). Hedonic prices and implicit markets: Product differentiation in pure competition. *Journal of political economy*, *82*(1), 34–55.

Rust, R. T., Ambler, T., Carpenter, G. S., Kumar, V., & Srivastava, R. K. (2004). Measuring Marketing Productivity: Current Knowledge and Future Directions. *Journal of Marketing*, *68*(4), 76-89. https://doi.org/10.1509/jmkg.68.4.76.42721

Shepherd, R., Magnusson, M., & Sjödén, P.-O. (2005). Determinants of consumer behavior related to organic foods. *AMBIO: A Journal of the Human Environment*, *34*(4), 352–359.