Does Italian origin really determine a price premium for fluid milk? Evidences from a hedonic price analysis

Samuele Trestini*,a, Alice Stilettoa

a University of Padova, Italy

Abstract

The regulation 1169/2011, which aims to protect the consumers in relation to food information, stresses the fact that the country of origin is become a key attribute for consumers in their purchasing decision. In 2014, the Italian Ministry of Agricultural, Food and Forestry Policies, with the Decree of 9 December 2016 – based on art. 26 of Reg. 1169/2011 – introduced the obligation of labelling the country origin of milk used in all dairy products and therefore for the first time for UHT milk. In this context, the aim of the study is to evaluate the price premium of different quality attributes on UHT milk sold in Italy, with particular regard to the country of origin of milk. From the analysis, it emerges that Italian origin of milk has a significant and positive effect on price, together with the type of retailer (i.e. hypermarket), notorious brands, plastic packaging, high and middle placement on the shelves, organic attribute and the enrichment with omega 3, phosphorus or fibre.

* *Corresponding author*: Samuele Trestini - Associate Professor - University of Padova, TESAF - Department of Land, Environment, Agriculture and Forestry - Viale Dell'Università, 16 - Legnaro (PD) - e-mail: samuele.trestini@unipd.it.

Introduction

Information plays a fundamental role in purchasing decisions and is often a discriminating factor in consumers' buying habits. In the last decade, in fact, national and international authorities draw up guidelines to guarantee a greater level of knowledge to consumers, to ensure them the possibility of choosing in a more conscious way. In reference to the food labels, the European Parliament and the Council of the European Union, with Regulation 1169/2011[1], have underlined the importance of providing comprehensive and easy to understand information of the product to the consumer, with the aim to help consumers during the purchasing decision, providing them all the elements they need for their choice. The quality concept is certainly one of the most important elements in the food sector and is a fundamental aspect in consumers purchasing decision. According to Lancaster (1971), consumers don't evaluate goods as such, but they are interested in products' characteristics that determine their quality. The traditional economic theory of consumer choice, however, assumes that consumers have perfect knowledge about the product they are willing to buy, but, as discussed by Steenkamp (1989), they are instead imperfectly informed about the quality characteristics of the product and this affects their purchasing choices. For this reason, information referred to the products' quality attributes stressed on the label became a very useful tool for consumers when they make a food decision and can have a positive effect on the purchasing choice, as found by Reis *et al.* (2017) and Lawless *et al.* (2015). Therefore, the European Union in 2011 promulgate Regulation 1169/2011, that lay the foundations for the assurance of a high level of protection of consumers in terms of food information, which is useful to lead them to make conscious choice in terms of health, economy, social and ethical aspects. Thus, the regulation aims to define the guidelines in terms of labelling, with particular attention to the information about the country of origin. Specifically, it details the products and cases which origin should be indicated in addition to nutritional aspects. According to it, the indication of the country of origin or of the place of provenance of a food should be provided "whenever its absence is likely to mislead consumers as to the true country of origin or place of provenance of that product. In all cases, the indication of country of origin or place of provenance should be provided in a manner which does not deceive the consumer". Due to the bovine spongiform encephalopathy crisis, the impact assessment of the Commission confirms that consumers' prime concern is linked to the origin of meat. It

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1. See the Regulation (Eu) No 1169/2011 of 25 October 2011 at https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:304:0018:0063:IT:PDF.

follows that, being the milk one of the products for which the indication of origin is considered of particular interest by the European Commission, it should be appropriate to assess the opportunity of a mandatory declaration of origin (Recitals 31 Reg. 1169/2011). Consumers every day are called to choose products originated in different country and the discriminating factor of the choice is given by the set of beliefs and images that consumers associate both to the brand and to the country (Erdem *et al.*, 2006; Otter *et al.*, 2014). Indeed, Keller (1998) highlight that this characteristic, linked to the brand, can actually affect consumers' perception about the quality of the products; people tend to evaluate a good as high-quality if it is associate with a country that is traditionally known for superior workmanship (Li & Wyer, 1994).

In 2014, the Italian Ministry of Agricultural, Food and Forestry Policies (MIPAAF) conducted a sample survey in Italy on 26,547 people on a voluntary basis, with the aim to measure how important are the different information reported on the label for the consumers. It emerges that the origin of the product plays a fundamental role in purchasing decisions and is closely related to food safety perception, especially for fresh milk and meat[2]. Based on these results, the Ministry of Agricultural, Food and Forestry Policies and the Ministry of Economic Development issued the Decree of 9 December 2016 – based on art. 26 of Reg. 1169/2011 – that obliges to put on the label the origin of milk, also for dairy products, providing the guidelines for different situations. The milk sector is growing worldwide in the last years also thanks to the advent of new producing countries in addition to the historical ones, namely USA and Europe (FAO, 2018). At the European level, Italy is showing signs of recovery after the difficult period caused by milk quota imposed at the EU level and because of the embargo and the Russian economic crisis. However, Italy's strength stands, as in other sectors, in the transformation process; Among the 299 PDOs (Protected Designation of Origin), PGIs (Protected Geographical Indication) and TSGs (Traditional Speciality Guarantee) of the Italian agri-food sector, 55 are cheeses, such as Asiago, Grana Padano, Parmigiano Reggiano. Despite this, Italy remains a net importer of milk and dairy products, with a level of self-sufficiency of 80% in 2017 (ISMEA[3]). In this context, the phenomenon of the Italian sounding is the icon of agri-food products' counterfeiting. By studying the main reasons behind the purchase of counterfeit, a recent study Cagnina *et*

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2. See also updated data available at: www.senato.it/application/xmanager/projects/leg18/attachments/documento_evento_procedura_commissione/files/000/001/388/ISMEA_13_marzo_ETICHETTATURA.pdf.

3. Available at: www.ismeamercati.it/flex/cm/pages/ServeAttachment.php/L/IT/D/7%252Fc%252F6%252FD.750e8be605e10207f973/P/BLOB%3AID%3D662/E/pdf.

al. (2018) found that especially the consumers with low income (i.e. the oldest and the youngest people) are the most prone to buy counterfeit food.

Beside the origin of the milk, health proprieties, environmental friendliness and the link with the territory are the main drivers of current consumption of milk and derivatives. In fact, despite the generalized decline in domestic consumption, there are very dynamic product segments due to the nutritional characteristics (e.g., functional or delactosate milk) or quality characteristics in terms of typicality and tradition linked to specific territories of origin (e.g., DOP-IGP cheeses) (ISMEA, 2019).

Since the application in Italy of art. 26 of Regulation 1169/2011 has made compulsory to label the country of origin of milk in dairy products, the aim of our study is to evaluate, through the estimation of an hedonic price model of UHT milk in Italy, the premium in price paid for the Italian origin of milk, together with several other milk features. We suppose that companies that sell products with Italian origin of milk can support this choice through a price policy that allows them to differentiate the product from the others.

The paper is structured as follows: the next section of the paper will present a literature review about the application of the hedonic price model to the food sector, the second section describes the data collection and the model specification and the third section will then present and discuss the results.

1. Background

In literature, ample space is given to the analysis of quality attributes through the hedonic price models. Usually applied for wine (Boatto *et al*., 2011; Caracciolo *et al*., 2013; Cicia *et al*., 2013; Costanigro *et al*., 2006; Trestini *et al*., 2018), due to the high number of attributes that characterize the product (Orrego *et al*., 2012), this type of analysis has also been used on other products in the food sector, such as fruit and vegetables (Carew *et al*., 2012; Huang & Lin, 2007), soft drink (Szathvary & Trestini, 2014) and animal products, such as fish (McConnell & Strand, 2000; Roheim *et al*., 2011) or eggs (Satimanon & Weatherspoon, 2010). Within this sector, there are applications of the hedonic price model also on milk and derivatives: Loke *et al*. (2015) analyse the effect of different variables, such as local sales, organic attribute and nutritional characteristics of milk in relation to the price of the product; Smith *et al*. (2009) estimate the hedonic equation on Nielson Homescan panel data in the US market on price premium related to household's socio-demographics characteristics, market factors (such as type of retailers, location of the point of sale etc.), product's attributes (such

as bottle size, fat or protein content, brand etc.) and organic attribute; Bimbo *et al.* (2015) estimate the contribution given by different attributes to UHT milk price in Italy. In the latter study, authors stress the importance of studying UHT milk and its perception among consumers in this country, being Europe the largest UHT milk market (Solomon, 2009) and Italy the country with the highest per capita consumption of UHT milk (estimated at 30L/individual per year) in Europe (Tempesta & Vecchiato, 2013). This is due to the popularity of the product that derives from its extended shelf life, a positive characteristic in countries where refrigerated spaces are small and stores tend to carry less inventory than in other countries, as United States. However, heat treatments, which allow on extended shelf life of the product, compromise the taste, giving to the product "cook" and "flat" aroma and off-flavours that derived from Maillard reaction (Liem *et al.*, 2016; Zabbia *et al.*, 2012). In countries where consumers mainly drink pasteurized milk, UHT milk, due to this different sensory profile, seems to be less appreciated if compared to pasteurized milk, but is worldwide guarantee of food safety, especially if it comes from countries that have a good culinary tradition (Liem *et al.*, 2016).

2. Materials and methods

2.1. *Data collection*

Data was collected during November and December 2017, in different retailers of the Vicenza province. 303 references have been catalogued in 6 hypermarkets, as these are the sale points that offer the widest variety of products and 3 discount stores, finding 46 different types of UHT milk on the hypermarket shelves compared to 17 in discount stores. The variables used to describe the products are: the brand, with 36 different brands of UHT milk, the milk type, consisting of whole milk, semi-skimmed and skimmed milk, the size of packaging, represented for the 71% by 1 litre of milk, the type of packaging, i.e., polycoupled cardboard or plastic bottle and the possible presence of a plastic cap, the origin of the milk (the core of our research). the price and the presence of any promotions, the shelf placement and the presence of additional compounds in the product (Table 1).

The product taken into consideration is only cow's milk treated with UHT technology that, due to its prolonged shelf life, could be present on the shelves for longer time than fresh milk. Not being perishable as quickly as fresh milk, UHT milk can be carried over longer distance. From 2016, it is compulsory to be label it with the country of origin.

Table 1 - Sample description statistics

Variable	Description	Type	N.	%
Type of retailer	**Type of retailer**			
Discount	*Dpiù, Eurospin, Prix*	D	24	7.9%
Hypermarket	*Auchan, Carrefour, Conad, Despar, Emisfero, Pam*	D	279	92.1%
Retailer	**The name of retailer**			
Auchan	*Milk sold in Auchan shop*	D	50	16.5%
Carrefour	*Milk sold in Cattefour shop*	D	52	17.2%
Conad	*Milk sold in Conad shop*	D	34	11.2%
Dpiù	*Milk sold in Dpiù shop*	D	7	2.3%
Emisfero	*Milk sold in Emisfero shop*	D	60	19.8%
Eurospin	*Milk sold in Eurospin shop*	D	7	2.3%
Interspar	*Milk sold in Interspar shop*	D	44	14.5%
Pam	*Milk sold in Pam shop*	D	39	12.9%
Prix	*Milk sold in Prix shop*	D	10	3.3%
Brand	**The brand of milk**			
Ala	*Milk branded Ala*	D	13	4.3%
Centrale del Latte di Vicenza	*Milk branded CLV*	D	29	9.6%
Granarolo	*Milk branded Granarolo*	D	45	14.9%
Latterie vicentine	*Milk branded Latterie vicentine*	D	12	4.0%
Mila	*Milk branded Mila*	D	11	3.6%
Sterilgarda	*Milk branded Sterilgarda*	D	16	5.3%
Parmalat	*Milk branded Parmalat*	D	67	22.1%
Lattebusche	*Milk branded Lattebusche*	D	6	2.0%
Latteria Soligo	*Milk branded Soligo*	D	5	1.7%
Private Label	*Milk branded with Private Label (Auchan, Carrefour, Conad, Despar, Pam, Selex, Prodotto Risparmio, S budget)*	D	47	15.5%
Type of milk	**Typology of milk**			
Semi skimmed	*Semi skimmed milk*	D	176	58.1%
Skimmed	*Skimmed milk*	D	54	17.8
Whole milk	*Whole milk*	D	73	24.1%

Table 1 - Continued

Variable	Description	Type	N.	%
Packaging	**Characteristics of packaging**			
Plastic	*Plastic package*	D	80	26.4%
Cardboard	*Polycoupled cardboard package*	D	23	73.6%
Bottle cap	*Package with plastic cap*	D	237	78.2%
Country of origin	**The milking country**			
UE	*Milked in other EU Countries*	D	93	30.7%
Italy	*Milked in Italy*	D	173	57.1%
France	*Milked in France*	D	9	3.0%
Austria	*Milked in Austria*	D	2	7.0%
No origin indicated	*No milking country reported*	D	26	8.6%
Shelf placement	**The product position in the shelf**			
High tier	*Eye level*	D	119	39.3%
Middle tier	*Leg level*	D	150	49.5%
Low tier	*Under Leg level*	D	34	11.2%
Promotion	*If milk is sold with a price discount*	D	24	7.9%
Enrichments	**The type of enrichments**			
Protein	*Protein integration*	D	1	0.3%
Vitamin	*Vitamin integration*	D	34	11.2%
Omega 3	*Omega 3 integration*	D	6	2.0%
Calcium	*Calcium integration*	D	8	2.6%
Fibre	*Fibre integration*	D	5	1.7%
Iron	*Iron integration*	D	2	0.7%
Phosphorus	*Phosphorus integration*	D	3	1.0%
Royal jelly	*Royal jelly integration*	D	1	0.3%
Organic	**Milk produced with organic method**	D	9	3.0%
Lactose-free	**Milk without lactose**	D	58	19.1%
Certified Quality	**Milk produced with a certified method**	D	16	5.3%
Microfiltered	**Milk treated with microfiltration**	D	14	4.6%
			Mean	**St. Dv.**
Volume	**The volume of package in litre**	C	0.85	0.252

Note: D = dummy variables; C = continuous variables.
Source: authors' elaboration.

2.2. *Model specification*

As reported by Lancaster (1966), each product is described by different characteristics that make it distinguishable from other products and that influence purchase decision. The hedonic price model is based on this hypothesis and explains how each consumer choses the optimal bundle of characteristics that maximizes his utility, considering the budget constraint to which he is subjected. The pioneer study in this area has been proposed by Rosen (1974), with the aim to quantify the implicit price associated to product's characteristics by the estimation of the so-called hedonic model. This model can be described by the following equation: $Pi = f(z_i)$, where P is the given price of the ith product and z is the vector of attributes of product i^{th}.

To perform a hedonic price model we need to collect, for a specific category of good, a sample of prices (Pi) and the associated list of product attributes (z_i).

Literature reported different alternatives of functional forms to estimate the hedonic price function, going from linear to log-linear. In this paper, Box-Cox transformation was applied on the dependent variable ($Y > 0$) to choose the best functional forms to estimate (Costanigro *et al.*, 2007; Rossetto & Galletto, 2019; Trestini *et al.*, 2018) as follows:

$$Y(\lambda) = \begin{cases} \frac{(Y^\lambda - 1)}{\lambda} & if \ (\lambda \neq 0) \\ \ln(Y) & if \ (\lambda = 0) \end{cases} \tag{1}$$

A set of model has been estimated for different values of λ, ranging from -2 to 2. Each value of λ corresponds to a specific transformation of the dependent variable (e.g. $\lambda = -1$ inverse transformation, $\lambda = 1$ linear, $\lambda = 0$ logarithmic). The preferred functional form is the one that has the lowest sum of the squared residuals ($\Sigma \varepsilon^2$).

The study will estimate two different models to deeply understand the value attached to the Italian origin of milk. The first model (Model 1) will broadly estimate the value of the Italian origin, while the second one (Model 2) will assess the premium price attached to Italian origin to each retailer through the estimation of the interaction effects.

In both the models, the residual sum of squares has the lowest value[4] when λ is equal to zero (Table 2) – (8.069) in the first and (7.289) in the second –, that corresponds to the semi-logarithmic functional form (2):

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4. The preference for the model with higher R^2 would lead to an incorrect choice. In fact, models with different λ cannot be directly compared based on the ability of the independent variable to explain the dependent variable variability, being the latter affected by its transformation.

$$\ln(P_i) = \beta_0 + \sum \beta_k z_{ki} + \varepsilon_i \qquad (2)$$

In this functional form, the $ln(P_i)$ is the log of the price of the ith product, z_k is the level of the k attribute, β_k are the estimated coefficients of the z_k attribute and ε_i the random error. This functional form allows to explain the percentage variation of the product price that is independently attributable to a specific characteristic. For continuous variables the percentage effect is estimated as $exp(\beta_k)-1$, while for dummy variables adjustment has been made accordingly to Kennedy (1981) formula (3):

$$g^* = \exp\left(\hat{c} - \frac{1}{2}\hat{V}(\hat{c})\right) - 1 \qquad (3)$$

where $\hat{c}$ is the dummy variable coefficient and $\hat{V}(\hat{c})$ is the variance of $\hat{c}$.

Table 2 - Estimated residual sum of squares and adjusted R^2 for different Box Cox transformations

Model without interactions (Model 1)			Model with interactions (Model 2)		
λ	$\Sigma\varepsilon^2$	Adj-R^2	λ	$\Sigma\varepsilon^2$	Adj-R^2
−2.00	18.987	0.661	−2.00	17.953	0.670
−1.50	13.178	0.689	−1.50	12.272	0.702
−1.00	10.067	0.706	−1.00	9.234	0.722
−0.5	8.551	0.711	−0.5	7.748	0.731
−0.33	8.292	0.711	−0.33	7.492	0.731
0.00	8.097	0.706	0.00	7.289	0.727
0.33	8.277	0.696	0.33	7.446	0.718
0.50	8.515	0.89	0.50	7.667	0.712
1.00	9.864	0.664	1.00	8.934	0.686
1.50	12.467	0.630	1.50	11.403	0.652
2.00	17.029	0.591	2.00	15.757	0.610

Note: λ referred to the different exponent of dependent variable(Y); $\Sigma\varepsilon^2$ is the sum of the squared of residues.
Source: authors' elaboration.

3. Results

The estimated model (*Model 1*) explains the log-price of a bottle (1 L) of UHT milk, sold in Vicenza province in November/December 2017, as a function of different variables, as reported in Table 3: estimations were obtained by using SPSS 25. The baseline is represented by a generic UHT whole milk, sold in a hypermarket, packaged in cardboard without plastic cap, with UE origin and with low tier shelf placement. These references correspond to an average price equal to 0.79 €/bottle. The model explains the variability of the dataset well (R^2 adj = 0.706).

In relation to the location of sales (*Type of retailer*), results, as expected, show that *Discount* (–22.8%) has a price discount if compared with *Hypermarket*. This is in line with what reported by Szathvary & Trestini (2014) and by Bronnmann & Hoffmann (2018), that underline how different types of shop can affect significantly product prices and, in particular, how discounters offers lower prices than other types of retailers. Also within the dairy sector, Smith *et al.* (2009) found that milk sold at discount store was priced 13 cents less per ½ l than milk sold through other venues (i.e. grocery store). In contrast, Lefèvre (2014) found that the type of store had no impact on the price of the product.

Considering the *Brand*, it is worth noting that, generally speaking, this attribute plays an important role for consumers because is considered a signal of product quality and, in light of this, companies have always used it to convey value to consumers. Results show that the most popular brands, such as *Ala* or *Granarolo*, have a price premium if compared to *Other brands*, respectively of +24.7% and +29.4%. Moreover, *Private labels* generates a price discount equal to –15.4% if compared to other brands, that are not so well known. Results agree with what found by Szathvary & Trestini (2014) for fruit beverages and by Bronnmann & hoffmann (2018) for soft drink.

Concerning the *Type of milk* variable, results suggest that *Semi skimmed milk* have a price discount equal to –4.2% compared to *whole* milk. Our findings are consistent with what found by Smith *et al.* (2009), Loke *et al.* (2015) and Bimbo *et al.* (2015), that reported that fat content significatively affect milk prices, guaranteeing a price premium for whole milk compared with skimmed and semi-skimmed milk. This is because milk fat has a market value and consumers have to pay a premium for the increased fat content due to the higher production costs.

Also the type of *Packaging* could affect product value because consumers consider the products that differ in the type of packaging to be of different quality (Underwood *et al.*, 2001). Our results indicate that *Plastic* bottle has a price premium equal to +11.0% if compared to the *Cardboard* packaging. This is in line with what reported by Bimbo *et al.* (2015) that found that

Table 3 - Estimates of the hedonic price model (Model 1)

Variable	β	St. Dev.	Sign.	Premium price
Type of retailer (compared to hypermarket)				
Discount	−0.258	0.051	***	−22.8%
Country of origin (compared to other origins)				
Italy	0.70	0.029	**	7.2%
Brand (compared to other brands)				
Ala	0.223	0.063	***	24.7%
Centrale del Latte di Vicenza	0.119	0.052	**	12.5%
Granarolo	0.259	0.047	***	29.4%
Latterie vicentine	−0.025	0.065	n.s.	−2.7%
Mila	0.003	0.074	n.s.	0.0%
Sterilgarda	0.104	0.063	n.s.	10.8%
Parmalat	0.049	0.049	n.s.	4.9%
Lattebusche	−0.057	0.082	n.s.	−5.8%
Latteria Soligo	−0.068	0.107	n.s.	−7.1%
Private Label	−0.166	0.045	***	−15.4%
Type of milk (compared to whole milk)				
Semi skimmed	−0.042	−0.026	*	−4.2%
Skimmed	−0.029	−0.033	n.s.	−2.9%
Packaging				
Plastic (compared to cardboard)	0.105	0.038	***	11.0%
Bottle cap (compared to packaging without bottle cap)	0.161	0.034	***	17.4%
Shelf placement (compared to low tier)				
High tier	0.138	0.039	***	14.7%
Middle tier	0.164	0.038	***	17.8%
Promotion	−0.203	−0.040	***	−18.5%
Enrichments				
Protein	0.152	0.183	n.s.	14.5%
Vitamine	−0.060	0.061	n.s.	−6.0%
Omega 3	0.318	0.103	***	36.8%
Calcium	0.008	0.128	n.s.	0.0%

Table 3 - Continued

Variable	β	St. Dev.	Sign.	Premium price
Fiber	0.248	0.108	**	27.4%
Iron	0.283	0.164	*	31.0%
Phosphorus	0.279	0.148	*	30.7%
Royal jelly	0.226	0.186	n.s.	23.2%
Organic	0.384	0.061	***	46.6%
Lactose-free	0.117	0.032	***	12.3%
Certified Quality	−0.26	0.070	n.s.	−2.8%
Microfiltered	0.022	0.054	n.s.	2.1%
Volume	−0.626	0.049	***	−46.6%
Intercept	0.390	0.068	***	
Adjusted R²	0.706			
N. Obs	303			

Note: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$; n.s. not significant.
Source: authors' elaboration.

plastic packaging increases the value of UHT milk of +17.9%. Concerning the *Bottle cap*, it emerges that its presence increases the product's price of +17.4%. This is linked both to the higher costs and to the higher consumers' WTP for this convenience attribute.

With respect to the *Country of origin*, which attribute is the core of our research, our results are unsurprising: we found that *Italian* origin of UHT milk has, on average, a price premium equal to +7.2 % compared to other origins. It is well established that consumers perceive home country-of-origin as being of higher quality than foreign ones (Verlegh & Steenkamp, 1999). This is consistent with findings outcome by Loke *et al.* (2015) and Zhang *et al.* (2018). Moreover, Tempesta & Vecchiato (2013), conducting a choice experiment with the aim to investigate the willingness to pay (WTP) a premium price for milk (considering origin, area of production and rearing method) found that people living in the northern of Italy tend to prefer milk produced in north-centre Italy, properly because of the affective and the cognitive components that affect the preferences for home country-of-origin products.

Regarding the *Shelf placement*, the model shows a very significant and positive role of the *Higher* and the *Middle tier*, implying a price premium

of +14.7% and +17.8% respectively compared to the *Lower tier*. Our results differ from what found by Rossetto & Galletto (2019), who found that wines placed at eye level do not show any significant price effect compared to those located in the middle tier.

Furthermore, we found, as expected, a significant and negative impact of sales *Promotion* on prices (–18.5%). Results agree with those outlined by Bronnmann & Hoffmann (2018) and by Zhang *et al.* (2018).

As milk is notoriously a source of protein, vitamins (A, D and B12), calcium, phosphorus and other compounds with health benefits, we investigated the role of some enrichments on the prices of UHT milk. However, only the content of *Omega 3*, *Fibre, Iron* and *Phosphorus* display a significant effect generating a price premium of +36.8% (*Omega 3*), +27.4% (*Fibre*), +31.0% (*Iron*) and 30.7% (*Phosphorus)*. This is in line with what reported by Bimbo *et al.* (2015) that found that Omega 3 and fibre add a positive premium on UHT milk prices.

Considering the lactose-free milk, it emerges that this characteristic determines a price premium of +12.3%, which is in line with what found by Bimbo *et al.* (2015). This may be due to the growing number of lactose-intolerant individual that are willing to pay more for have guaranteeing the absence of lactose in the dairy products as well as to the higher production costs.

The *Organic* certification leads to a price premium equal to +46.6% highlighting the growing importance of this attribute on consumers' perception. Since many consumers believe that organic products are healthier than conventional ones and have a superior quality, it should be recalled that asymmetric information can be decisive in this context and it could determine a distorted premium price (McCluskey, 2000). Our results are consistent with findings outlined by Smith *et al.* (2009), Bimbo *et al.* (2015), Loke *et al.* (2015) and Abraben *et al.* (2017) on milk and wine products.

Finally, our results suggest that also the bottle size (*Volume*) is a significant variable that affect negatively the UHT milk price. The coefficient of a continuous explanatory variable, in a log-linear equation, measures the relative change in the dependent variable (Roselli *et al.*, 2018): it follows that a negative coefficient of the "*Volume*" variable (–46.6%) leads to a decrease in price when the size of milk bottle increase, as expected. This result, which agrees with Pilone *et al.* (2017), is consistent with the practice of weight discounting that retailers usually offer with fresh packaged products (Loke *et al.*, 2015).

We have then estimated a second model (*Model 2*) – keeping all the variables of first model – with the aim of evaluating the policies applied by the different retailers in reference to the Italian origin of milk (Table 4). The variability of the dataset is well described by the model (R^2 adj = 0.727).

Table 4 - Estimates of the hedonic price model with interactions of the Italian origin with the retailer (Model 2)

Variable	β	St. Dev.	Sign.	Premium price
Origin*Retailer (compared to other origins)				
Italy*Auchan	−0.026	0.042	n.s.	−2.7%
Italy*Carrefour	0.162	0.040	***	17.5%
Italy*Conad	0.055	0.048	n.s.	5.6%
Italy*Dpiu	0.224	0.092	**	24.6%
Italy*Emisfero	−0.046	0.046	n.s.	−4.6%
Italy*Eurospin	0.039	0.121	n.s.	3.2%
Italy*Interspar	0.063	0.043	n.s.	6.4%
Italy*Pam	0.073	0.043	*	7.5%
Italy*Prix	0.125	0.112	n.s.	12.6%
Other variables (omitted)				
Intercept	0.398	0.067	***	
Adjusted R^2	0.727			
N. Obs	303			

Note: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$; n.s. not significant.
Source: authors' elaboration.

The basic reference price for a litre of generic and whole milk, with foreign origin, sold in a hypermarket in a cardboard packaging, without promotion and enrichments or quality certifications, is 0.804 euros.

From the estimates of the first model it emerges that, on average, the *Italian origin* of the product pays a price premium of +7.2%. However, evaluating the effect of the Italian origin on the milk prices in the various retailer, it emerges that only Carrefour (+17.5%), Dpiù (+24.6%) and Pam (+7.5%) add a significant and positive price premium on the product. Thus, although on average the price of Italian milk is higher than that of imported milk, adding higher value to the Italian origin of the product is a choice of the retailer. This decision is also subordinated to the consumer segment towards which retailers direct their offer, which largely differentiate price premium for the milk origin. Assuming that the price premium for the Italian milk is on average 5.6 cents/L, it must be stressed that this value varies from zero, when price premium is not significant (*n.s.*), to +24.6%

(*Dpiu*) – that corresponds to a premium of 20 cent/L – according to the different retailers. The price premium may depend not only on the higher consuemers willingness to pay, but also on the higher costs of the raw materials. In fact, if we consider the price of raw Italian spot milk[5], it emerges that this has a price premium, to date, equal to 7.5 cents per litre if compared with European raw milk. We should also consider that about 75% of the milk made in Italy is used for the production of cheeses (mainly PDO). Through this channel the milk is paid more compared to other destinations typically characterised by a lower level of differentiation (i.e. UHT milk).

Conclusions

It is not always easy to know whether what we bring to our tables is really what we expect. In some cases, foods may hide some information that could be useful in the choice of purchase. In this context, labelling plays a fundamental role, by characterising different products in a specific way; Regulation 1169/2011 aimed to ensuring the greatest safety and transparency through labelling, guaranteeing consumers a more informed choice. In Italy, the decree of 9 December 2016, in application of the article 26 of Reg. 1169/2011, aims at protecting consumers in this respect, paying particular attention to the dairy sector by introducing compulsory labelling about the country of origin of milk. Our study sheds some light on the price premium generated by different attributes, with particular attention to the country of origin on UHT milk in Italy. Literature stresses the fact that having more information about a certain product in terms of nutritional value and, specifically, in terms of country of origin, adds value to it and this lead, at an application level, to a competitive advantage for the good richer in information. Our results, in fact, have measured, in a real market, what has already been observed by literature through consumers' study, recognising the important role played by the Italian origin of food products for Italian consumers. We found a premium price attached to Italian UHT milk equal to (+7.2%) compared to the foreign one. This price premium derives from both the higher cost of supply for the processors and the higher WTP of the consumer, that is an expression of the reputation referred to the Italian origin.

The main contribution of our study consists to highlighting the opportunities of Italian dairy sector and our results could support producers and retailers in defining the price at which the Italian UHT milk can be

5. See for instance the milk prices on call.it at www.clal.it/en/?section=grafici_latte.

placed on the market. Furthermore, the estimates obtained allow to better define the pricing strategy for a product in the real market.

However, it should be noticed that, when it comes to the origin of a good, it is easy to be confused. There is a real difference between the declaration of "made in" and the origin of agricultural products used to produce foods: a good transformed in Italy but with raw materials coming from abroad is still defined as "made in Italy". Being able to say that a product is "made in" certainly may be useful for commercial purposes: just think about the great prestige of the "made in Italy" and the countless attempts at counterfeiting. It is understood that, in this way, it became very easily to trick the consumer. Regulation 1169/2011 aims to provide clarity in this regard, minimising the negative effects caused by information asymmetry. This would allow to protect, among other, the Italian products, which are notoriously perceived as high-quality goods. On the other hand, it should be recalled that a real protection of the Italian supply chain (based on the renowned transformation ability of Italy in the food sector) requires an effective awareness about the production capacities of Italian agriculture. In fact, Italy is self-sufficient only in few supply chains. This means that, for example, for milk and the dairy sector in general, our agriculture it is not enough productive. In this case, Italy have to import raw materials, and their foreign origin will appear on the label, being the product anyway made in Italy.

It can be useful to highlight some limitations linked to the research. First, being a case study, the results have value only in the market under investigation. Indeed, in other markets there may be different price premiums, due to different consumers' preferences and production costs. We expect that in the Italian and EU markets differences on consumers' preferences for the country of origin will play the main role. Furthermore, according with previous statements, this aspect cannot be measured directly estimating the hedonic price model. By the way, the estimation of our second model allows getting some insight about the role of the demand on premium price for country of origin attribute, confirming our hypothesis about the relevant role of consumers segment selected by retailers.

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Samuele Trestini
Department of Land, Environment, Agriculture and Forestry (TeSAF) - University of Padova
Viale dell'Università, 16 - Legnaro (PD), Italy
Tel: +39 (0)49 827 2737, E-mail: samuele.trestini@unipd.it
Associate professor, Vice Director of the Department of Land, Environment, Agriculture and Forestry, Director of the InterUniversity Center for Agricultural, Forestry and Environmental Accounting and Management (CONTAGRAF), Italy. Current research interests include the issues of agri-food economics and policy in the area of price analysis, international trade, marketing and consumer behavior, farmers and food industry strategies in relation to agricultural and food policy.

Alice Stiletto
Department of Land, Environment, Agriculture and Forestry (TeSAF) – University of Padova
Viale dell'Università, 16 - Legnaro (PD), Italy
E-mail: alice.stiletto@unipd.it
MSc, Research Fellow at the University of Padova. Current research interests include food science and technology, consumer behavior towards food quality attributes, food sensory analysis, food markets and policy of the European Union.

Appendix

Table A1 - Estimates of the hedonic price model with interactions of the Italian origin with the retailer (Model 2)

Variable	β	St. Dev.	Sign	Premium price
Type of retailer (compared to hypermarket)				
Discount	−0.312	0.061	***	−27.0%
Origin*Retailer (compared to other origins)				
*Italy*Auchan*	−0.026	0.042	n.s.	−2.7%
*Italy*Carrefour*	0.162	0.040	***	17.5%
*Italy*Conad*	0.055	0.048	n.s.	5.6%
*Italy*Dpiu*	0.224	0.092	**	24.6%
*Italy*Emisfero*	−0.046	0.046	n.s.	−4.6%
*Italy*Eurospin*	0.039	0.121	n.s.	3.2%
*Italy*Interspar*	0.063	0.043	n.s.	6.4%
*Italy*Pam*	0.073	0.043	*	7.5%
*Italy*Prix*	0.125	0.112	n.s.	12.6%
Brand (compared to other brands)				
Ala	0.197	0.062	***	21.5%
Centrale del Latte di Vicenza	0.124	0.051	**	13.1%
Granarolo	0.242	0.046	***	27.2%
Latterie vicentine	0.000	0.064	n.s.	−0.2%
Mila	0.010	0.073	n.s.	0.8%
Sterilgarda	0.093	0.063	n.s.	9.6%
Parmalat	0.007	0.049	n.s.	0.6%
Lattebusche	−0.001	0.082	n.s.	−0.4%
Latteria Soligo	−0.038	0.105	n.s.	−4.3%
Private Label	−0.194	0.044	***	−17.7%
Type of milk (compared to whole milk)				
Semi skimmed	−0.046	0.025	*	−4.6%
Skimmed	−0.033	0.032	n.s.	−3.3%
Packaging				
Plastic (compared to cardboard)	0.114	0.037	***	12.0%
Bottle cap (compared to packaging without bottle cap)	0.146	0.033	***	15.6%

Table A1 - Continued

Variable	β	St. Dev.	Sign	Premium price
Shelf placement (compared to low tier)				
High tier	0.153	0.038	***	16.5%
Middle tier	0.187	0.038	***	20.4%
Promotion	−0.208	0.039	***	−18.8%
Enrichments				
Protein	0.218	0.179	n.s.	22.4%
Vitamine	−0.070	0.059	n.s.	−6.9%
Omega 3	0.353	0.100	***	41.6%
Calcium	0.024	0.124	n.s.	1.6%
Fibre	0.270	0.105	**	30.3%
Iron	0.295	0.158	*	32.6%
Phosphorus	0.281	0.142	**	31.1%
Royal jelly	0.302	0.183	n.s.	33.0%
Organic	0.379	0.059	***	45.8%
Lactose-free	0.142	0.031	***	15.2%
Certified Quality	−0.039	0.068	n.s.	−4.1%
Microfiltered	0.009	0.059	n.s.	0.7%
Volume	−0.613	0.048	***	−45.9%
Intercept	0.398	0.067	***	
Adjusted R^2	0.727			
N. Obs	303			