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Differences between Italian specialty milk in large-scale retailing distribution

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Abstract

The specialty milk market in Italy has shown positive trends in recent years. Companies, from small producers to market leaders, continue to invest in differentiating their product lines, increasingly orienting their production choices towards specialties linked to sustainability and health benefits. This trend not only meets the needs of consumers, who are increasingly attentive to sustainable and healthy foods, but it also has a significant impact on the production and profitability of milk companies. Thus, this research aims to analyse the composition of specialty cow milk assortments in different large-scale retail (LSR) stores in North-West Italy. The objectives were to define the assortment depth of sustainable and health-focused milk categories, as well as the marketing policies currently applied in the LSR market for such products. Differences in the assortment of seven specialty product categories were evaluated with regard to brands, milk origin and packaging material, using the Correspondence Analysis. Price differences between product categories were analysed using ANOVA and comparing the product brands and the different formats of large-scale retailers. The main results highlight the key characteristics and differences of the specialty milk supply, taking into consideration the main sales channel of this type of product.

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Introduction

Consumer interest in sustainable and healthy products has increased due to environmental and nutritional concerns (Imami *et al*., 2017; Magan *et al*., 2021). Despite the negative scenario that has characterised the cow milk market in recent years, milk consumption over the last two years has shown signs of recovery, with consumers increasingly orienting their choices towards sustainable (local and organic) and health-focused product varieties (ISMEA, 2019, 2021a). Over the last five years, there has been a 7% decline in the amount of milk purchased by Italian households; this decrease in consumption mainly affects fresh milk, followed by long-life milk (Ultra High Temperature - UHT treated milk) (ISMEA, 2019a, 2021a, 2021b). In addition, after signs of recovery in UHT milk consumption during the Covid-19 pandemic, the consumption trend resumed its decline in 2020/2021 (ISMEA, 2021c). This trend may have been instigated by claims regarding the negative effects of cow's milk on human health (Haug *et al*., 2007) and on the environment (Bava *et al*., 2014; Capper and Cady, 2012; Castanheira *et al*., 2010), which have seen consumers reduce/eliminate their milk consumption or choose alternative protein sources (Haas *et al*., 2019).

In this sense, according to the Ismea-Nielsen Consumer Panel Service data recorded at the Italian national level, the drop in milk consumption was partly influenced by the emergence of new healthy eating styles and more environmentally and ethically sustainable production choices, rather than by economic ones (Haas *et al*., 2019; Rizzo *et al*., 2020; ISMEA, 2021a, 2021b). In fact, the economic crisis that marked the period from 2015 to 2020 only partially affected milk consumption trends, with a shift towards lower cost distribution channels such as discount stores. At the same time, several studies have shown how food choices, even in the case of milk, are closely related to the socio-demographic characteristics of consumers (Gulseven, 2018). A recent study conducted by ISMEA (Institute of Services for the Agricultural Food Market) in 2019 (ISMEA, 2019b) showed that, on average, 33% of consumers surveyed in this research do not consume milk; this proportion rises progressively as the age of the subjects increases, reaching 42% between the ages of 55 and 64. Among the under-18s, the proportion of those who gave up milk was much lower. Given that the Italian population is ageing and decreasing (ISTAT, 2021), the decline in milk consumption could be a result of this negative demographic trend.

However, in a context of general decline, the specialty milk categories have followed a positive trend. Highly digestible milk or lactose-free milk has undergone exponential growth with a 47% increase in purchases over the last five years, thanks both to a doubling of the number of purchasing

households and a significant expansion of the range and product types offered on the shelves (ISMEA, 2021a, 2021b). Functional (enriched) and organic milk specialities – respectively linked to healthiness and sustainability – and lactose-free products, are currently very appealing to consumers (Rama, 2019). In relation to certified organic cow's milk, numerous research projects reveal that consumers recognise this product as being a more sustainable alternative, linked to the local production area and to traditional farming systems (Carfora *et al*., 2019; Gambelli *et al*., 2003; Scotti *et al*., 2015). Moreover, as revealed by a recent study on milk consumer preferences carried out in North-West Italy (Tabacco *et al*., 2021), in a sample of 502 consumers, around 30% of individuals identified organic certification and local production as important drivers of their choice of milk.

Italian production of organic milk exceeds 300 million litres (about 2.7% of the total milk produced), with a value of 158 million Euros (equal to 3.5% of the national BPP, i.e. the base product price) and a premium price of 28% more than conventional milk (De Ruvio, 2016). On the other hand, household expenditure on organic dairy products in large-scale retail (LSR) chains is worth more than 100 million Euros, with these products representing about 12% of the total sales of certified food products in this distribution channel.

Functional or 'enriched' and/or 'flavoured' milk – i.e. supplemented with nutrients that can positively influence health, prevent pathological conditions or have therapeutic functions – suffered a 4.1% decrease in average price and 0.2% reduction in volumes before 2020. As explained by Rama (2019), this trend may be attributable to the growth in the share of hard discounters, where lower prices are usually recorded and for which there was a 15.9 % increase in volumes sold on an annual basis.

Since the first half of 2019, there has been an increase in purchases of 9.2%; this indicates that a recovery is currently underway, highlighting the emergent interest of consumers in functional products, such as those with added omega 3, vitamins, etc. In recent years, the increasing of selling price of these products has led producers – from small companies to leading brands – to differentiate themselves by creating various lines of functional products. In general, cow's milk producers have invested a great deal of resources in achieving more sustainable production systems and, at the same time, establishing brand repositioning strategies; they have done this by focusing on product categories considered more in line with consumer needs and following drivers of choice linked to product sustainability and healthiness (Redazione Dairy, 2020a).

Background

Despite the numerous scientific publications on consumer preferences, perception, and choice orientations towards specialty milks such as organic and functional/enriched (Ares *et al*., 2009a; 2009b; Dekker *et al*., 2019; Palacios *et al*., 2009; Peng *et al*., 2006; Rizzo *et al*., 2020), to the best of our knowledge, few studies have been carried out on the supply characteristics of specialty cow milk in Italian distribution channels (Trestini and Stiletto, 2020). This research focuses on the comparison between different types of product attributable to the milk specialties category by applying statistical techniques of investigation and comparison already adopted in our previous research dedicated to conventional milk (Merlino *et al*., 2021). In particular, the comparative approach described in Merlino *et al*. (2021) made it possible to describe and compare some characteristics of the different products considered in detail.

The decision-making process underlying product assortment planning in large-scale retail is fundamentally important to a product's success on the market. The marketing choices on which assortment planning decisions are based, such as size, depth, positioning, window display, etc., change periodically considering each storage unit and the different LSR formats (Mantrala *et al*., 2009; Merlino *et al*., 2021). Indeed, as revealed by Merlino *et al*. (2021), product characteristics linked to marketing components (product, promotion, price and positioning) change considerably in the composition of the assortment, depending on the format (of the large-scale retail trade), product line and geographical area, in line with consumer demands, which are also heterogeneous in the different geographical contexts. For example, when considering different LSR formats, the product assortment changes from supermarkets, where there is a large assortment with low to medium prices, to discounters, where the level of service and quality of product display decreases in favour of more competitive prices, up to hypermarkets, characterized by a wide assortment with medium prices. In addition, convenience stores, which focus their offer on small-scale, locally marketed products with a higher price and service level, are becoming popular in large Italian cities (Chernev, 2011; Solgaard and Hansen, 2003).

Data reported in Rama (2019) showed that lactose-free and enriched milks have increased their share of purchases in recent years, mainly at hard discounters, at the expense of hyper/supermarkets. The assortment planning process is complex because, in addition to considering market dynamics – whose complexity depends on the nature of the product – they depend on the demands of end consumers (Dhar *et al*., 2001). This is closely linked, amongst other things, to the opinion individuals have of the brand. Therefore, the brand directly influences the credibility and safety of the product.

Given these premises, this research aims to analyse the assortment of specialty milks by examining the products marketed in various stores of large-scale retail chains in North-West Italy. In particular, the goal is to define the assortment depth (A_{depth}) considering different categories of specialty milks and to compare factors related to product sustainability (Merlino *et al*., 2021). In detail, the A_{depth} was compared considering the product brand, origin and packaging. These three product features have been considered as factors characterising specialty milk sustainability for the following reasons:

- in the case of local origin, it can be considered an indicator of sustainability by consumers as it is synonymous with short supply chain, a concept that simultaneously embodies the three pillars of sustainability: environmental, social and economic (Annunziata & Mariani, 2018; Aprile *et al*., 2016; Balboni, 2017; Bentivoglio *et al*., 2019; Wang *et al*., 2019);
- the brand of a product combines the name, logo, slogan, storied communication and reputation. It is also a distinctive sign for the company that encompasses images and values, such as sustainability (Chen *et al*., 2017; Grubor & Milovanov, 2017);
- packaging material is an important feature supporting product sustainability from the consumer perspective and its enhancement is a continuous challenge for the food producer (Chen *et al*., 2019). However, recent research carried out on consumers' milk packaging preferences (Merlino *et al*., 2020) found that consumers do not consider packaging to be an important driver when choosing products, but that they would be willing to pay a premium price for more sustainable packaging for milk and a high service value.

Lastly, specialty prices were evaluated by comparing different formats and brand categories to ascertain the price policies used by milk producers.

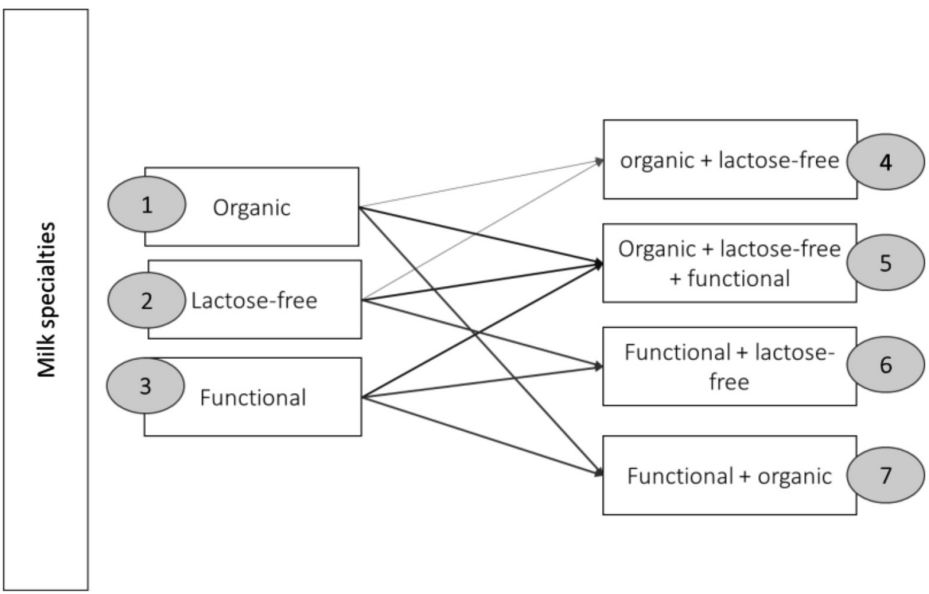
1. Materials and methods

Sampling

All information on the products that make up the cow's milk portfolio in the milk specialty categories was collected by visiting 52 points of sale of 8 different large-scale retailers (LSR), including hypermarkets, supermarkets, convenience stores and discount stores in North-West Italy (Piedmont and Lombardy regions). The considered area plays an important role in the national production of cow's milk; in fact, 53.5% of the milk produced in Italy comes from these two regions (ISMEA, 2021d; OMPZ, 2020). The survey period focused on March to June 2019. In particular,

the assortment depth (A_{depth}) (which is the number of product variants or items, references or stocked units – SKUs – within a product category with separate designations in the offer price list) of seven product lines (Merlino *et al*., 2021) was examined. Each item was assigned to a milk category, numbered from 1 to 7, following the classification criterion reported in Figure 1. Starting from the three main categories of speciality milks on the market, the references analysed in the shops were allocated to the three groups (1, 2 and 3) only if they were characterised by just one of the following features: being (1) organic, (2) lactose-free, or (3) functional. In particular, the "organic" category included all milk products originating from organic farms (EC 834/2007; EC 889/2008), while "lactose-free" included all products whose label contained the words "no lactose", "0 lactose" or "lactose-free". As the point-of-sale analysis revealed that many products included several characteristics at the same time (e.g. they were both organic and lactose-free), we created sub-categories by matching the three main product categories in different combinations (Figure 1).

Figure 1 - Classification criterion used to group and code specialty milk products into the seven categories



Finally, the "functional" group included all products with at least one of the claims listed in Table 1.

Table 1 - Label claims considered for classifying functional milk

Label claim*
–30% of sugar, with fibre (Inulin) and vitamins A and D3
–30% of sugar, source of magnesium and vitamins B6 and B12
–30% of sugar, source of protein
Enriched with vitamins A and D3
With vitamin D
1.6% fat
30% less sugar
34 kcal
With cocoa
With green coffee and ginger, lactose-free
With ginseng and liquorice, lactose-free

* The presence of at least 1 or more of the following claims concurrently on the label meant the product was included in the "functional/enriched" category.

For each SKU the origin, brand, packaging materials and price features were collected from all considered outlets (Table 2).

Table 2 - Product characteristics collected for all milk products sold at the different stores of large retail chains

Characteristic	**Definition**
Origin	National, regional, EU, non-EU, other countries
Packaging material	Plastic, glass, laminated composite material
Brand	Distributor Brands or private label (DB), Leading producer brands (L) and Other Producers/brands (OP)
Price	Single price for each item

The brands were categorised into Distributor or Private label (DB), Leading producer brands (L) and Other Producers/brands (OP) following the criteria used by the Italian Dairy Association (Assolatte, 2018), already used in recent research by Merlino *et al*. (2021).

Statistical analysis

In order to describe the association between the different milk specialty categories (from 1 to 7, see Figure 1) and the different product variables (origin, packaging material and brand), a series of Correspondence Analyses (CA) were conducted by analysing [specialty categories x brand category], [specialty categories x packaging material] and [specialty categories x milk origin].

CA is a statistical technique used to identify patterns and associations between category variables and simultaneously to organise them graphically with the considered specialty categories (nominal variables) in the same dimensional space (Ayele *et al*., 2014; Lana *et al*., 2017; Merlino *et al*., 2021). The CA draws the frequency points of rows and columns of a contingency table in a same geometric space, constructing the data representation in an area structured by a chi-square distance; it then continues by representing the variables on the basis of the identified principal components (axes) (Ayele *et al*., 2014; Beldona *et al*., 2005; Gursoy and Chen, 2000). In the map, greater proximity between the points highlights a higher proportion associated with the different levels of rows and columns. Furthermore, this technique allows the number of prevalent dimensions to be determined based on the different associations of multinomial variables (Beldona *et al*., 2005; Gursoy and Chen, 2000; Harcar and Spillan, 2006). In this research, singular values greater than 0.20 were considered (Hair *et al*., 1998). In the results' section, all eigenvalues (estimated dimensions, single values, inertia, and the proportion explained by each dimension) were reported. Therefore, this technique provides a complete view of the data for effective interpretation.

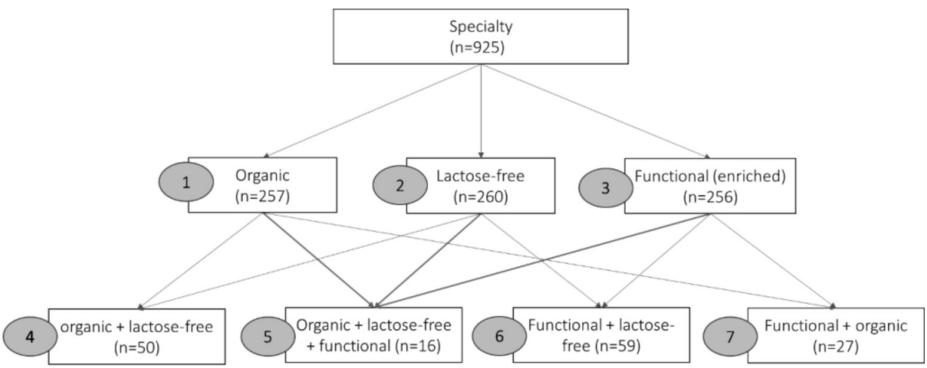
This technique is widely used in the scientific literature, and the theoretical properties of CA can be further explored by external consultation (Beldona *et al*., 2005; Fotuhi *et al*., 2019; Greenacre, 2017). The Analysis of Variance (ANOVA) test was performed to verify the H0 (there were no significant differences in the average prices of milk specialty groups across the different formats in large retailers) and the H1 (there were no significant differences in the average price of milk specialty groups considering the different brand groups). We performed several two-way ANOVAs in order to test the main effect and interaction effects of milk specialties (7 categories) with each of the other independent variables (LSR formats – 4 levels, and brand groups – 3 levels) on the average milk price (dependent variables). The ANOVA is able to identify the difference between the mean values, but not to specify the relationship between the averages. However, the calculation of main effects and interactions, used to explain the pattern of relationships between the averages, enabled us to minimise this methodological limitation (Buckless & Ravenscroft, 1990).

All statistical analyses were performed using SPSS 27.0 for Windows.

2. Results and Discussion

The analysis of data on the composition of the supply of cow's milk in different LSR stores reveals the great competitiveness of specialty milk in the drinking milk sector. Indeed, the portfolio of cow's milk specialities consisted of 925 product items. The three main product categories with only one classification criterion (only organic, only lactose-free, only functional) were equally distributed in terms of A_{depth}. From the product categories that were characterised by the presence of more than one product classification, the most important group in terms of A_{depth} was category 6 (functional and lactose-free), followed by category 4 (organic and lactose-free) (Figure 2).

Figure 2 - Composition of the cow's milk portfolio. All specialty categories considered with their depth (A_{depth}) are described



These initial results reveal that the lactose-free characteristic is the most recurrent in the sample, confirming that this product characteristic appears in an increasingly wide range of milk categories, and dairy products in general (Dekker *et al*., 2019). As reported in a survey published online (Food, 2019), in addition to the simple free-from claim, consumers reward the combination with other pluses. However, our results show that the A_{depth} of products with multiple claims (lactose-free + other) is much smaller than that of products coded as 1, 2 and 3.

The results of the Correspondence Analysis on the association between brand groups and milk specialty categories (brand groups x specialty categories) are described in Figure 3. The eigenvalues (estimated dimensions, single values, inertia and proportion explained by each dimension) are given in Table 3.

Table 3 - Correspondence analysis (brand categories x specialty categories). The chi square of independence between the two variables (columns and rows) and the p-value are also reported

Dimensions	Singular value	Inertia	Proportion explained %	Cumulative proportion %	Chi Square	Sign.
1	**0.548**	**0.301**	**0.986**	**0.986**		
2	0.064	0.004	0.014	1.000	260.988	***
Total		0.305	1.000	1.000		

The accepted dimensions are highlighted in bold. The p-value refers to the statistical significance level: *** <0.001, ** <0.01, * <0.05; no value when not significant.

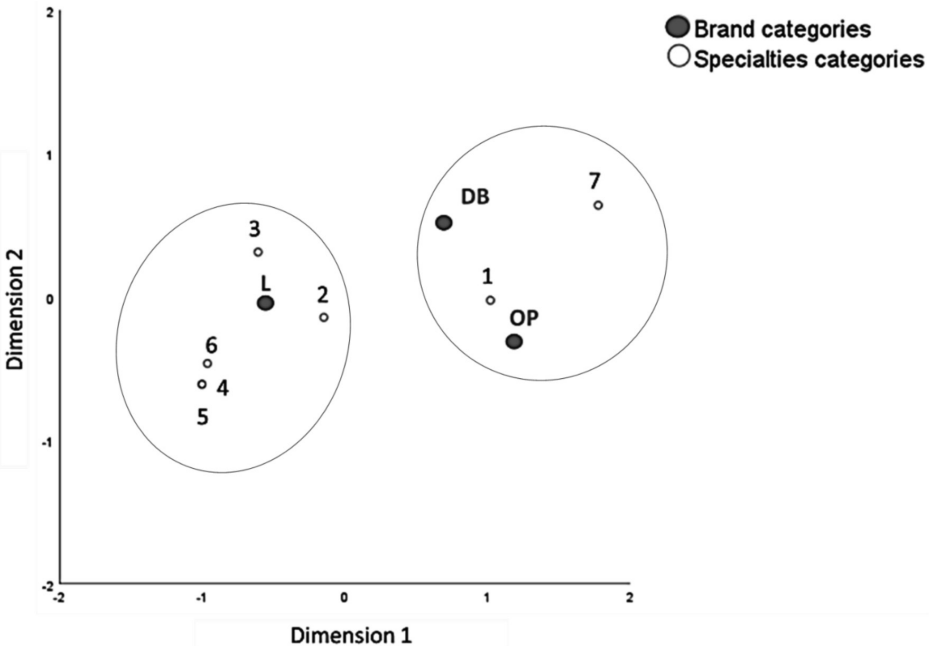
In this case, according to Hair *et al.* (1998), a one-dimensional solution can be accepted. In particular, dimension 1 shows the largest relative contributor to the total variance (98.60%) of the axis.

As shown in Figure 3, the "functional" and "lactose-free" milk specialties, even in their combinations, follow the same position and seem to be associated with leading brands (L). Consequently, the "organic" and "organic and functional" categories are mainly associated with brands of smallholder producers (OP) and retailers (DB).

These results show that leading brands focus on differentiating their products, mainly promoting milk products with healthy characteristics that meet the needs of consumers having intolerance problems or looking for a product with health benefits. Market leaders thus seem to focus on improving their own reputation by investing in products that are beneficial to consumers, which is currently also the most attractive and fastest growing market segment (Redazione Dairy, 2020b).

In contrast, both smallholder producers and retailers plan their specialty milk supply by offering primarily certified organic milk, some of which is also functional. It can therefore be inferred that the communication of the certified organic production – often linked to the environmental, social and economic sustainability by the consumer (Naspetti *et al.*, 2021; Schiano and Drake, 2021) – is the strength of private labels and small companies, differentiating them from leading producers. The effect of value and retailer brand loyalty is stronger for consumers who frequently choose the same categories of purchased products (such as regular products like milk) (Merlino *et al.*, 2021; Morales *et al.*, 2005); this is also true in the case of retailer-branded organic milk, hence. This confirming that the product differentiation strategy can improve brand reputation, particularly for small producers (Chernev, 2011; Hoch and Lodish, 1998). The decision of the

Figure 3 - Correspondence Analysis (brand categories x specialty categories)



OP = other producers; **L** = leader brands; **DB** = private labels; **1** = organic; **2** = lactose-free; **3** = functional (enriched); **4** = organic and lactose-free; **5** = organic, lactose-free and functional; **6** = functional and lactose free; **7** = functional and organic.

"other producers" category to focus on organic certification, rather than on functional milks, could be due to the high degree of complexity involved in investing in R&D and technology upstream of enriched or free-from milk production (Dekker *et al*., 2019; Fatkullin *et al*., 2021). This result could also be interpreted as the response of small producers to the low margins and high uncertainty (mainly related to low competitiveness against the major players) that characterise the conventional milk market, in addition to the strong increase in consumer demand for organic food products (Antonioli *et al*., 2019).

The extraction of the dimensional solution for the Correspondence Analysis between the variables (milk origin indication x specialty categories) considers two principal dimensions (axes) which account for 92.6% of the total variance (Table 4) as significant (following the limits of singular values greater than 0.20) (Hair *et al*., 1998).

Table 4 - Correspondence analysis (milk origin indication x specialty categories). The chi square of independence between the two variables (columns and rows) and the p-value are also reported

Dimensions	Singular value	Inertia	Proportion explained %	Cumulative proportion %	Chi Square	Sign.
1	0.318	0.101	0.641	0.641	134.957	***
2	0.212	0.045	0.285	0.926		
3	0.081	0.007	0.042	0.967		
4	0.070	0.005	0.031	0.998		
5	0.017	0.000	0.002	1.000		
Total		0.158	1.000	1.000		

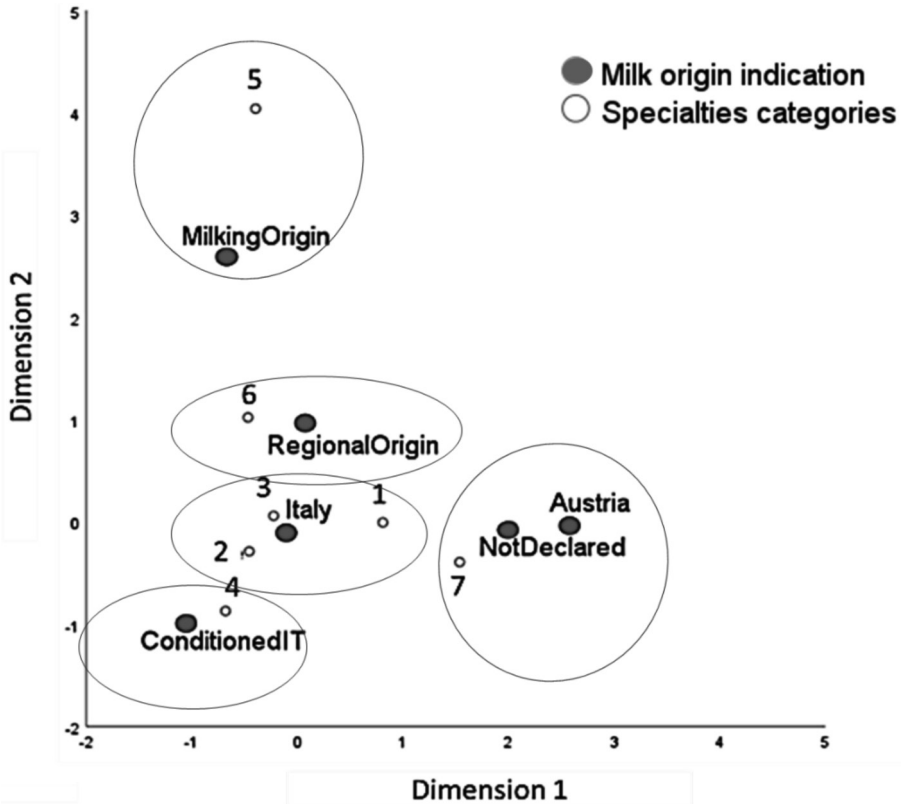
The accepted dimensions are highlighted in bold. The p-value refers to the statistical significance level: *** <0.001, ** <0.01, * <0.05, no value when not significant.

As can be seen from Figure 4, there is a high association between specialty categories 1, 2, 3 and national origin. This is an interesting result which reveals that milk producers have disclosed the country of origin of the milk on the label, despite the fact that, for most of these functional products (they are mostly UHT) and for organic products, there is no such regulatory obligation; a generic origin, such as "EU countries", can be indicated. This is in line with the result of a great deal of research carried out even nationally, which found that the indication of national origin is the most important attribute of choice for cow's milk (Tabacco *et al*., 2021; Tempesta and Vecchiato, 2013).

By contrast, the association between the most complex product category (5) and "functional and lactose-free" (6), with the origin of the indication of the milking process and the indication of regional origin, respectively, is quite surprising. In the latter case, companies aim at product differentiation while promoting the health benefits of the functional product for consumers and the regional/national origin of the product. While UHT was initially the only lactose-free option on the market, the range is now also growing in the refrigerated section, indicating continued growth of the segment. Additionally, inspired by the high quality national/regional origin of these products, households are increasingly switching to lactose-free dairy products when a single member is lactose intolerant, driving sales in this segment (Dekker *et al*., 2019).

Conversely, product categories where organic certification is associated with other characteristics (e.g. functional or lactose-free milk) originate mainly from European countries.

Figure 4 - Correspondence Analysis (milk origin indication x specialty categories)



ConditionedIT = EU origin, conditioned in Italy; **Austria** = Austrian milk origin; **Italy** = Italian milk origin; **RegionalOrigin** = indication of the Italian region of milk origin; **MilkingOrigin** = indication of the region or area of product milking; **NotDeclared** = milk origin not declared on the label; **1** = organic; **2** = lactose-free; **3** = functional (enriched); **4** = organic and lactose-free; **5** = organic, lactose-free and functional; **6** = functional and lactose free; **7** = functional and organic.

From analysing the correspondence between "packaging materials x specialty categories", a one-dimension solution emerged as significant, accounting for 98.7% the total variance (Table 5).

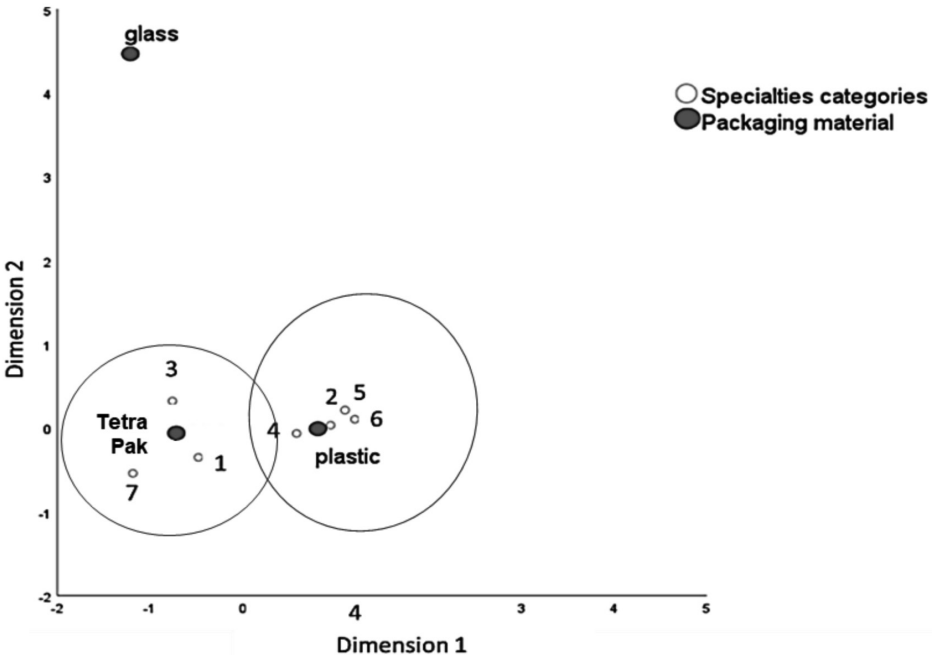
Figure 5 shows the net grouping of specialty categories 4, 5, 6 and 2 associated with plastic packaging material. In parallel, categories 3, 1, and 7 appear to be associated with laminated composite material (i.e. Tetra Pak). As a counter-trend, glass material (the minority of material used for packed milk) is only associated with the "functional" product. Although glass is positively correlated with environmental sustainability and consumer

Table 5 - Correspondence analysis (packaging materials x specialty categories). The chi square of independence between the two variables (columns and rows) and the p-value are also reported

Dimensions	Singular value	Inertia	Proportion explained %	Cumulative proportion %	Chi Square	Sign.
1	**0.628**	**0.395**	**0.987**	**0.987**		
2	0.071	0.005	0.013	1.000	341.859	***
Total		0.400	1.000	1.000		

The accepted dimensions are highlighted in bold.
The p-value refers to the statistical significance level: *** <0.001, ** <0.01, * <0.05, no value when not significant.

Figure 5 - Correspondence Analysis (milk packaging x specialties categories)



Glass = milk packaging in glass bottle; **plastic** = milk packaging in plastic bottle; **Tetra Pak** = milk packaging in laminated composite material container; **1** = organic; **2** = lactose-free; **3** = functional (enriched); **4** = organic and lactose-free; **5** = organic, lactose-free and functional; **6** = functional and lactose free; **7** = functional and organic.

perception in terms of quality and tradition (Centrale del Latte di Torino, 2019), the logistical issues associated with its use mean it is rarely used for milk packaging. While for conventional milk, plastic is still the main packaging material used (Merlino *et al*., 2021), speciality milks largely use laminated composite material, followed by plastic. However, differences emerge between the various product categories, demonstrating that functional and organic milks are those most associated with laminated composite material, while the use of plastic is associated with lactose-free milk. In this case, the association between the use of laminated composite material and organic milk is in line with the needs of Piedmont consumers, who are interested in organic milk (Tabacco *et al*., 2021) and its sustainability in relation to the possibility of recycling and the environmental sustainability of the packaging (Merlino *et al*., 2020).

The price analysis in the various categories of specialty milk revealed significant differences when comparing both LSR formats and brand categories.

In particular, as shown in Table 6, the organic, functional and lactose-free categories appear in all the analysed formats, while the other categories reveal a lower A_{depth}, even amounting to 0 in discounters for products 7 and 4. Considering the average prices of the different categories (Table 6), higher prices can be seen for groups in which the various characteristics (claims) are combined (groups 4 to 7), compared to products belonging to groups 1, 2 and 3 (organic, functional and lactose-free only).

This result is understandable given the greater complexity, including technological issues, that characterises more expensive products (Dekker *et al*., 2019). Among the specialties in groups 1, 2 and 3, the category that has the highest average price is functional milk, which is priced about 40% higher than the conventional product marketed in the same geographical area (Merlino *et al*., 2021). This price differential is in line with the average recorded in literature, where the lactose-free product was found to be 4 to 166% more expensive than conventional milk (Świąder *et al*., 2020) (Suri *et al*., 2019).

As described in Table 7, the ANOVA analysis demonstrates that it was largely the single effect of the "format" that significantly influenced price differences between the various categories, except in the case of the main effect of the "functional" variable.

Table 6 - Average price (€/l) recorded for each category of specialty milk comparing the formats in large-scale retail chains (LSR)

Format	Organic		Lactose-free		Functional		Organic and functional		Lactose-free and organic		Lactose-free, organic, functional		Lactose-free and functional	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Discount	1.190 (n=4)	0.209	0.985 (n=6)	0.266	1.911 (n=2)	0.322	/	/	1.259 (n=3)	0.125	/	/	1.265 (n=5)	0.026
Hypermarket	1.582 (n=113)	0.340	1.402 (n=110)	0.423	1.810 (n=161)	0.660	1.556 (n=10)	0.058	1.885 (n=30)	0.095	1.855 (n=10)		1.756 (n=30)	0.395
Convenience store	1.705 (n=39)	0.814	1.534 (n=27)	0.477	1.624 (n=20)	0.519	1.520 (n=7)	/	1.965 (n=5)	0.065	2.04 (n=1)	/	1.630 (n=7)	0.493
Supermarket	1.621 (n=101)	0.534	1.440 (n=117)	0.431	1.833 (n=73)	0.717	2.860 (n=10)	1.628	1.97 (n=12)	0.197	2.50 (n=5)	/	1.803 (n=17)	0.188
Total mean	1.610 (n=257)	0.514	1.425 (n=260)	0.432	1.806 (n=256)	0.666	2.110 (n=27)	1.173	1.910 (n=50)	0.134	1.892 (n=16)	0.233	1.736 (n=59)	0.271

Table 7 - ANOVA results: effect of each specialty category, format and interaction of product price

Factors	Independent variable	df	Quadratic mean	F	Sig.	Partial η2
Organic vs. format	Format	3	1.236	4.341	***	0.004
	Organic	2	7.313	25.688	***	0.150
	Format * Organic	5	0.384	1.347	0.241	0.002
Lactose-free vs. format	Format	3	1.691	5.827	***	0.005
	Lactose-free	3	0.809	2.788	*	0.020
	Format * Lactose-free	6	0.309	1.065	0.381	0.002
Functional vs. format	Format	3	0.325	1.164	0.322	0.001
	Functional	1	5.966	21.357	***	0.050
	Format * Functional	3	0.593	2.122	0.095	0.002
Functional and organic vs. format	Format	3	7.564	26.179	***	0.023
	Functional and organic	2	0.855	2.960	0.085	0.001
	Format * Functional and organic	1	3.073	10.635	***	0.006
Functional and lactose-free vs. format	Format	1	1.691	5.837	**	0.002
	Functional and lactose-free	3	5.557	19.188	***	0.017
	Format * Functional and lactose-free	2	0.124	0.428	0.652	0.000
Lactose-free and organic vs. format	Format	3	5.557	19.188	***	0.017
	Lactose-free and organic	1	1.691	5.837	*	0.002
	Format * Lactose-free and organic	2	0.124	0.428	0.652	0.000
Functional, organic and lactose-free vs. format	Format	3	5.575	19.189	***	0.017
	Functional, organic and lactose-free	1	0.676	2.328	0.127	0.001
	Format * Functional, organic and lactose-free	1	0.026	0.089	0.765	0.000

The p-value refers to the statistical significance level: *** <0.001, ** <0.01, * <0.05.

These results explain how the type of functional/enriched products significantly affects the average price revealed in the different LSR formats. The interactions between variables are not significant, except in the case of "Format * Functional and Organic". In particular, discounters market products in the different categories, generally at the lowest price, except in the case of organic milk.

In most of the cases considered, excluding the "lactose-free and functional group", convenience stores and supermarkets set the highest prices for each category of specialties. In general, both the A_{depth} and the average prices of specialty categories comply with the pricing policy and assortment planning strategies commonly used in the different formats of large-scale retailers (Solgaard and Hansen, 2003; Zielke, 2010). The purchasing channel is therefore a discriminating factor in the definition of the price of milk specialties (Stiletto, 2020). In addition, supermarkets and hypermarkets reveal a comparable depth of assortment for the two best-selling categories in the

specialty milk market (organic and lactose-free). Despite the differences in assortment depth between these two formats, the planning policies of these two product lines seem to be moving towards equalising the number of the type of items available. Indeed, in recent years, an increase in the volumes of specialty milks sold in supermarkets only has been observed (Rama, 2019).

The largest Partial η^2 (expressing the effect size of each variable) emerged in relation to the main effect of the organic variable (0.15), evidencing reasonable effect size and indicating that this variable explains 15% of variance in the definition of the average price. Finally, even when comparing the different brand categories, the average prices for each specialty varied significantly. In this case, the A_{depth} was very heterogeneous between the different brand groups (Table 8), highlighting how the specialties refer mainly to private labels (or brand of distributor), followed by the leading brands.

This result is in line with the definition of market leader and also with the choices made by distributors to increasingly differentiate the range of products available in the various stores. As reported in the recent Assolatte report (Assolatte, 2018) and in the research by Merlino *et al*. (2021), a large amount of milk present in LSR distribution is identifiable based on the distributor's brand. Private labels, on the other hand, allow retailers to increase the degree of product differentiation, while simultaneously building up the level of customer loyalty and the brand value of the product through unique identification with the point of sale.

Across the three main milk specialty categories, the highest average price was recorded in leading brands for organic and functional milk, while for "Other producers" the highest price was for lactose-free milk. In general, the distributor brands held the cheapest product items in all specialty categories (Bonanno and Lopez, 2005; Kumar, 2007).

By analysing the ANOVA table (Table 9), it can be seen that the main effect of the brand group is always significant, except in the case of lactose-free milk, for which it is the "brand group*lactose-free" interaction that has a significant influence on the product price setting.

This result confirms the importance of the brand, a key element for the company, as a discriminating factor in defining the selling price, above the type of product itself, and as an element of differentiation of a product (Sudari *et al*., 2019). In our research, each company seems to have a different price management strategy, highlighting the importance of this element for the consumer's evaluation of the product. The result is price inhomogeneity among product types influenced by the brand. Thus, in the case of the speciality milk, the brand reflects the high reputation of the producer/brand, the high level of customer loyalty, and the level of satisfaction. From this dynamic, it appears that product choice is almost exclusively dictated by brand choice (Mariska *et al*., 2019). At the same time, the combined effect of

Table 8 - Average price (€/l) recorded for each category of milk specialty comparing the brand categories

Brand Group*	Organic		Lactose-free		Functional		Organic and functional		Lactose-free and organic		Lactose-free, organic, functional		Lactose-free and functional	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
OP	1.569 (n=112)	0.724	1.719 (n=43)	0.514	1.527 (n=9)	0.401	2.525 (n=18)	1.489	/	/	/	/	/	/
DB	1.480 (n=83)	0.246	1.393 (n=35)	0.094	1.259 (n=32)	0.417	1.557 (n=9)	0.058	1.910 (n=50)	0.134	1.892 (n=16)	0.233	1.550 (n=1)	/
L	1.807 (n=62)	0.133	1.359 (n=174)	0.423	1.901 (n=211)	0.664	/	/	/	/	/	/	1.739 (n=58)	0.272
Total mean	1.610 (n=257)	0.514	1.425 (n=260)	0.432	1.806 (n=256)	0.666	2.110 (n=27)	1.173	1.910 (n=50)	0.134	1.892 (n=16)	0.233	1.736 (n=59)	0.271

* Brand groups: OP = other producers; DB = private labels; L = leader brands.

brand and lactose-free in the definition of the price suggests that, in the case of lactose-free products, consumer choice is also dictated by the nutritional characteristic of milk (lactose-free), in addition to the to the product brand. The health issue behind the choice to buy lactose-free milk defines a purchasing pattern especially based on the safeguarding of consumer health. Indeed, in the consumer's decision-making process for lactose-free milk, the prevention of gastric disturbances is the first choice motivation, for which the consumer would also be willing to pay a higher price (Rizzo *et al.*, 2020).

Considering the size effect, the Partial η^2 are low in all cases, except between organic and brand groups.

Conclusions

This research aimed to explore the characteristics of specialty milk supply in different formats of large-scale retail distribution, investigating aspects related to product sustainability (such as origin and packaging), assortment depth, proportion of branding, and pricing policies used for the various product categories. We adopted the same methodology used in our previous research pertaining to conventional cow milk allowing the characterization of the whole cow's milk supply, both of conventional and specialty products, available in the large-scale retailing distribution of the considered market.

Our key findings show that the supply of the specialty milk assortment is characterized by a wide range of organic and functional products to meet the demands of consumers who are increasingly attentive to sustainable and healthy milk. Furthermore, the massive presence of leading and OP branded products especially linked to the indication of national or local origin on the label, highlights how the indication of origin is an important differentiation and recognition factor used by speciality milks producers.

The specialty milk market is continuously growing and has major strengths compared to the conventional product, related to the high level of differentiation, product innovation and price competitiveness. In this sense, research demonstrates a high penetration rate of these products, which are offered on the market in different combinations, widely in different LSR formats and at a price higher than that of the commodity. In addition, we have seen how specialty milk producers encourage the implementation of product features according to consumer needs (from choice of packaging to indication of origin), creating clear growth opportunities for an increasingly competitive and expanding market.

This research highlights the strengths that characterise the specialty milk market; however, the limited geographical area investigated should be considered a limit of this research. Given the socio-demographic

heterogeneity and lifestyles of the Italian population, which certainly determine different food choices, it would be interesting to replicate the research in north-east, central and southern Italy and make a cross-area comparison of the characteristics of the special milks supply. Although this market segment represents an important source of income for producers, these results could provide ideas and concrete tools for growth and differentiation (e.g. indication of origin, differentiation of packaging) also for the conventional milk market which, even now, is continuing its negative trend mainly due to the constant decrease in consumption. Therefore, these results can be used by companies as a tool to evaluate the LRO in terms of milk specialties in order to increase company awareness and the added value of product differentiation strategies on the market.

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