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RESEARCH ARTICLE

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Who buys regional fresh milk brands? An analysis of German household data

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Abstract

Farmstead dairies produce, process, and market their milk locally under their own brands. Farmstead dairy brands (FDB) are thus competing against private labels and manufacturer brands, whose milk often comes from different areas and which are sold nationwide. Even though FDB cannot benefit from industrial economies of scale, they represent a small but successful and growing segment where demand has been rising for years, even though the demand for milk in general has been rather stagnant. Based on data from a German household panel it is evident that marketing of FDB milk through retail stores meets the trend for regional products and some consumers are increasingly willing to pay for local and regionally produced food. The results of a zero-inflated negative binomial model revealed that middle-aged, high income, and organic buying behaviors significantly influenced the purchase frequency of FDB milk in food retail. [EconLit Citations: Q130, D120, C23].

KEYWORDS

consumer, farmstead dairy brand, local food, zero-inflated negative binomial regression model

Abbreviations: EAN, European Article Number; e.g., exempli gratia (for example); FDB, Farmstead dairy brand(s); GfK, Gesellschaft für Konsumforschung; max, maximum; min, minimum; ppv, price per volume; std. dev., standard deviation; WTP, willingness to pay; ZINB, zero-inflated negative binomial.

1 | INTRODUCTION

The German dairy sector comprises a growing number of dairy farms that have started farm-based dairy processing alongside developing their own branded milk. These farmstead dairies sell their products through regular retail chains, rather than relying on direct-to-consumer marketing via farm shops or weekly markets alone. Milk brands from farmstead dairies provide consumers with products from a short and transparent supply chain. Farmstead dairy brands (FDB) are characterized by the following four elements: (i) milk originates from one farm or a small number of farms, (ii) it is branded local/regional on its package, (iii) it is processed locally, most often by the farm itself (i.e., not sent a large distance for further processing), and (iv) is sold in retail stores where it competes for space in shelves against other milk brands from large, industrial dairy processors. This definition is in line with Liu et al. (2020), who define local dairy brands as brands of small local farms that process their own milk and sell their products on the local market.

Thus, the development of farmstead dairy processing and related own-farm brands may represent an alternative strategy for dairy farmers, while being able to generate higher value-added than that achieved by raw milk sales in the usual domestic bulk market. Nevertheless, it remains unclear whether and to what extent dairy farmers' fresh milk brands actually represent a separate market segment. So far, the number of dairy farmers' fresh milk brands, the development of their market share, and the most promising target customers among the customers of supermarkets are still largely unknown.

Furthermore, the recent development in dairy farmers' fresh milk brands in Germany has to be seen against the backdrop of the overall development of the European dairy sector: Germany is the fifth largest raw milk producer in the world (FAOSTAT, 2022) and, after the abolition of the EU quota in 2015, the German dairy sector's production and export orientation has increased, along with price dependence on global markets for butter and milk powder. While the German dairy industry has since been competitive overall with its exports of bulk dairy products, per capita consumption on the German market has been declining for a number of years (AMI, 2021). Furthermore, the German dairy industry is dominated by a cooperative structure that is known for being reluctant to invest in brands, image, and premium quality products (Petersen & Hess, 2018; Schramm et al., 2005). German dairy farmers who seek to escape these structures are typically restricted to the few dairy processors that target the domestic premium market, most of whom are in the south of the country. Alternatively, farmers can try to market their milk directly, for example, through delivery services and vending machines, or process it on the farm for direct sales of cheese in farmers' markets.

Farm-based dairy processing and own-brand sales through retail chains may, therefore, offer an alternative marketing strategy. One advantage of this could be that a potentially greater quantity of milk could be sold in retail stores than through direct-to-consumer marketing, while higher average prices than those offered by industrial dairy processors could perhaps be achieved.

In Germany, milk and dairy products are consumed daily by 64% of the population and consumer interest in milk produced in the region is high (BMEL, 2020; 2021), matching consumer's growing preferences for local and regionally produced food (BMEL, 2020; Feldmann & Hamm, 2015; Hasselbach & Roosen, 2015). Various studies have shown that consumers are willing to pay more for regional products (e.g., Emberger-Klein et al., 2016; Gracia et al., 2012; Onozaka & McFadden, 2011; Rihn & Yue, 2016). However, there are differences between product groups, and "willingness to pay" (WTP) is not identical for all products (Feldmann & Hamm, 2015; Illichmann & Abdulai, 2013; Roosen et al., 2012). A lack of availability and unclear labeling of food origin present obstacles to the purchase of regional products (Conner et al., 2010; Trobe, 2001; Zepeda & Leviten-Reid, 2004).

Milk consumers are not a homogeneous group—they have quite different expectations and are also attracted to different product characteristics (Tempesta & Vecchiato, 2013). Regional origin can be one of the consumer preferences for milk (Harwood & Drake, 2018; Khanal et al., 2020; Zander & Hamm, 2010). Selling through food retailers could be a promising way to market regional milk because consumers mostly buy their regional products from food retailers or directly from the producer (Spielmann & Bernelin, 2015; Zepeda & Leviten-Reid, 2004).

However, selling through retailers does not guarantee success for FDB because consumers commonly consider milk to be a commodity product with little difference between brands. There is also a lot of competition in food retailing due to the large number of milk brands. While the majority of milk sales are made through retail stores, FDB face the challenge of establishing themselves in stores and positioning themselves against commercial brands.

There have been few studies on local milk (Burchardi et al., 2005; Harwood & Drake, 2018; Hasselbach & Roosen, 2015; Schröder et al., 2005; Tempesta & Vecchiato, 2013; Zander & Hamm, 2010) and only one on milk from farmstead dairies (Liu et al., 2020). These studies were based on consumer surveys and investigated consumers' WTP or preferences for additional ethical attributes. One study used retail scanner data and focused on marketing strategies for retail promotion (Liu et al., 2020). Survey results enable consumer characteristics to be analyzed, but frequently do not reflect true purchasing behavior. Scanner data, however, can map true buying behavior, but do not contain buyer attributes.

No work has as yet analyzed the retail sales of FDB using a household panel dataset about actual retail store purchases and thus investigated households' real purchasing behavior and characteristics. The present research helps close this gap in the literature. By capitalizing on a rich dataset of German household purchases of fresh milk brands between 2012 and 2015, this study identified the characteristics shared by consumers of FDB and the life situations where there was the greatest probability of FDB milk being purchased from food retailers. Over time, an increasing interest in these products was identified. Thus, the present study provides evidence of the existence of a small but growing market segment that lies between large-scale, industrial dairy processing chains and alternative, local direct sales by farmers in farm shops or farmers' markets.

This paper is organized as follows: the section below presents a brief review of the related literature on the demand for regional and local food. Section 3 describes the data, while Section 4 introduces the estimation approach for modeling the purchase frequency of farm-based dairy products by German households. Section 5 presents estimation results, Section 6 discusses these results and Section 7 concludes the study.

2 | LITERATURE REVIEW

Milk from farmstead dairies can be described as "regional" products and could benefit from the increasing demand for these products overall. Since there have been few studies on regional milk, the results from research on other regional products were also taken into account. The results of these studies on regional foods are presented hereafter: There is no clear distinction in the literature between consumers' perspectives on "regional" versus "local" food. A literature survey by Feldmann and Hamm (2015) highlighted a significant increase in the number of scientific publications on these subjects in the last few years.

Consumers often treat the term "regional" in relation to distance. German consumers understand regional products to be items that have been produced and processed in the same region and come from a distance of no more than 20–100 km (Wägeli & Hamm, 2012). Consumers buy local food because they associate these products with certain characteristics, including better quality and taste (e.g., Adams & Adams, 2011; Chambers et al., 2007; Naspetti & Bodini, 2008). Consumers often associate higher quality with freshness, health, and well-being (Chambers et al., 2007; Jensen et al., 2019; Naspetti & Bodini, 2008). Other attitudes toward regional food are altruistic in nature and include support for the local economy, environmental concerns (e.g., Burchardi et al., 2005; Hasselbach & Roosen, 2015; Kumar & Smith, 2017), and the preservation of jobs in the region (Jensen et al., 2019). Consumers also seem to associate supporting small farms with buying regional products (Meas et al., 2015). One possible reason for not buying local food could be consumer perception that regional food is expensive or not always available (Chambers et al., 2007; Khan & Prior, 2010).

Given how consumers view local products, of interest is which consumer characteristics, such as age, income, place of residence, gender, and household size influence their views and purchasing behavior of regional products.

Consumers with more interest and with a more positive attitude toward local foods tend to be older than the average consumer (Khan & Prior, 2010; Megicks et al., 2012; Tregear & Ness, 2005). In contrast, younger people are less likely to buy regional products (Khan & Prior, 2010) and Åsebø et al. (2007) found that younger people in Norway in 2003 were less interested in how and where their food was produced. Other studies, however, found no relationship between age and preferences for regional products (Brown, 2003; Zepeda & Li, 2006).

Income also has an influence on purchasing behavior: Several studies found that consumers with higher incomes tend to buy regional products more frequently than consumers with lower incomes (Khan & Prior, 2010; Stanton et al., 2012). However, there are also studies that found no statistically significant correlation between income and the purchase behavior of regional products (Brown, 2003; Zepeda & Li, 2006). Zepeda and Li (2006) suggest that income may not exhibit a statistically significant likelihood of purchasing regional foods due to the small share of spending on regional foods in total food expenditures. However, one should take into account that their data was collected about 10 years before ours in the United States.

Consumers in urban areas seem to have a lower intention to buy regional products than consumers in rural areas (Megicks et al., 2012; Racine et al., 2013; Tregear & Ness, 2005). Furthermore, consumers who live in rural areas are more aware of and enthusiastic about local food (Weatherell et al., 2003). Schröder and Burchardi (2004) showed that the WTP for regional milk from Hesse, a federal state in Germany, is higher among the rural population in comparison to consumers living in a city with a population of 50,000 or more. In contrast, Chambers et al. (2007) did not find any differences in attitudes between rural and urban consumers in their data from 2005 for the United Kingdom. Another study shows that if family members or their parents grew up on a farm, these households have a greater interest in regional products and are willing to pay more for them (Brown, 2003).

Some studies have found an influence of gender on the probability of buying local products: women buy local food more frequently than men (Bellows et al., 2010; Jensen et al., 2019; Loureiro & Umberger, 2003; Pelletier et al., 2013). However, neither Zepeda and Li (2006) nor Åsebø et al. (2007) found a statistically significant relationship between gender and attitudes for local food.

Household size can also have an effect on regional food purchasing behavior. Schröder and Burchardi (2004) show in their study that the WTP for regional milk decreases with increasing household size. Furthermore, another study by Schröder et al. (2005) on WTP for fresh milk shows that there is no correlation between WTP and sociodemographic characteristics such as student status, unemployed, or retirement.

3 | DATA

To investigate consumer characteristics of FDB buyers, data from the German household panel of the Gesellschaft für Konsumforschung (GfK), collected from households throughout Germany, were used for the analysis. Households in the panel record their purchases and provide socioeconomic information about household members. This study's dataset contained 2,740,954 observations on purchase events of milk in food retail from 2012 to 2015 on household level. Observations with incomplete information about the household ($n = 78$) or the dairy brand ($n = 10{,}726$) and records of households that did not buy milk at least once a year ($n = 905{,}983$) were excluded. All information on purchase prices and the number and size of packages were checked and the volumes were made equitable (e.g., one package of 12,000 ml was changed into 12 packages of 1 L each). As a result, a total of 1,824,167 observations from 16,841 households were included in the analysis.

The initial dataset comprised 213 different milk brands from different manufacturers not considering additional subcategories such as fat content, for the period under consideration. The brands were classified into one of the following categories: (i) FDB, (ii) private label (e.g., belonging to a supermarket chain), or (iii) manufacturer's brand. This distinction between FDB and other milk brands was in line with the approach taken in the study by Liu et al. (2020), where FDB were called “local brands,” distinguishing them from “private labels” and “national brands.” “Local brands” are produced by smaller local farms, processed, distributed in the local market, and often use the local label

on their packaging (Liu et al., 2020, p. 657). For each of the 213 milk brands, an online search was conducted to obtain information from the firm's websites or other websites. The goal of the research was to determine the number of milk producers that deliver for the corresponding brand. A search was also conducted for images of milk packaging to analyze whether consumers are able to identify the milk as FDB.

Our definition for selecting a brand as an FDB was (i) the milk originates from one farm or a small number of farms, (ii) it is branded local/regional on its package, (iii) it is processed locally, most often by the farm itself, and (iv) is sold in retail stores. This could be single farmers, who have dairy farms, operating dairy processing facilities and process only the milk from their own cows or a small dairy processing operation with milk supplied by fewer than 13 dairy farms from the surrounding area. The limit of 13 dairy farms was determined somewhat subjectively because descriptive data inspections revealed that there exists a gap in the number of milk suppliers. On the one hand, there is a small group of dairies that receives milk from very few dairy farms (less than 13 dairy farms) and on the other hand, there are all the other dairies that are supplied by more than 40, 100, or 2000 dairy farmers. There are no farms with 13–40 suppliers in the data.

In contrast to farmstead dairies that produce exclusively their FDB, other dairies often produce different brands. These brands include private labels, which are produced for a retail company and distributed exclusively through the retail chains' stores, and manufacturer brands, where a manufacturer markets its branded products nationwide through various distribution channels. Figure 1 shows the decision scheme according to the milk brand classification. The first step was to investigate whether the brand was an FDB.

Table 1 shows that most FDB (n = 13) were affiliated with just one farm, but there was also one FDB that was supplied by four dairy farmers, one FDB that was supplied by five dairy farmers, and two FDB that were each supplied by 12 dairy farmers. The next largest dairies were supplied by 45, 62, and 97 milk producers, respectively, and the largest dairies by about 3000 milk producers. Regular dairies, which often produce different brands and trademarks, did not indicate on their websites how many farms supply them. However, farms that only process their own milk or small dairies that only have a few suppliers from the region often signaled on the package that their products are milk from a farmstead dairy. For example, “Bauernhof Fockenbrock” and “Gut Wilhelmsdorf” are brands of single dairy farms with their own dairies in the federal state of North Rhine-Westphalia. The dataset shows that milk from these FDB was only purchased in that federal state. Another example is the FDB “Bio Hofmolkerei Dehlwes,” a small dairy processing operation that processes milk from its own dairy farm and 11 other dairy farms located within an average radius of 10 km (Bio-Hofmolkerei Dehlwes, 2019). The dairy is located in

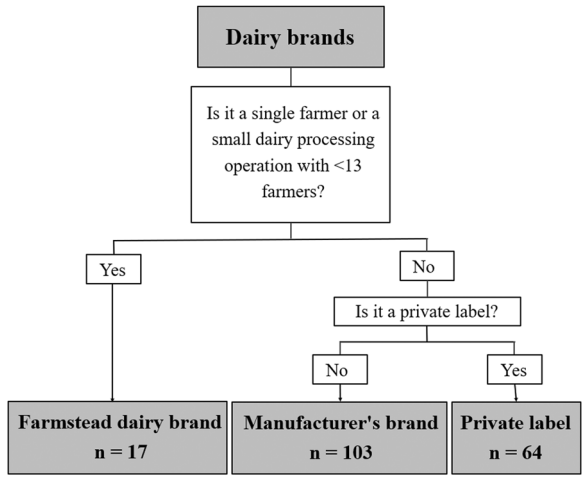

FIGURE 1 Milk brand classification scheme. *Source*: own diagram.

TABLE 1 Number of milk producers behind the farmstead dairy brands

Number of dairy farmers supplying the brand	Number of farmstead dairy brands (n = 17)
1	13
4	1
5	1
12	2

Source: Authors' calculations.

Lower Saxony, right on the border with Bremen (two federal states in North Germany), and the dataset shows that 95% of its milk is purchased in these two federal states.

If the question ("Is it a single farmer or a small dairy processing operation with <13 farmers?") could be answered with a "yes," the brand was classified as an "FDB". If it was not a farmstead dairy, the final question was whether it was a private label or manufacturer's brand. This process resulted in the identification of 17 FDB, 64 private label brands, 103 manufacturers' brands, and 29 brands that could not be classified. The 29 brands that could not be classified due to missing or incomplete information were excluded from the sample (loss of n = 10,726). Of all 1,824,167 observations, 9911 purchases of 17 different FDB by 759 FDB buying households were observed.

In the next step, an investigation was carried out into whether farmstead dairies designed their packaging in a way that allows consumers to identify the origin. Consumers typically identify regional products via signals given on the packaging and label (Meyerding et al., 2019). FDB usually match the desire for products that are produced and sold regionally. Therefore, the question was whether the brand name had a regional reference, such as to a federal state, city, or region, for example, "Bliesgaumolkerei" ("Bliesgau" is a region in Germany) or "Horster" ("Horst" is a commune in the federal state of Schleswig-Holstein). If there was no regional reference in the brand name, the packaging was checked for regional labels, words, or claims—for example, claims such as "from the region, for the region", words associated with regionality such as "dairy farm," or labels such as "Geprüfte Qualität Schleswig-Holstein" (Geprüfte Qualität = tested quality). Of the 17 milk brands which were included in our analysis as FDB, eight brands had a regional reference in their brand name, and eight packages featured a regional claim or label or an indication that it comes from a farmstead dairy. Only one of the FDB had no regional reference in the brand name or other regional information on the package, but meets all other requirements of our definition for an FDB.

The data included information on the milk purchased, such as the European Article Number (EAN, an internationally unique product label for commercial articles), whether it was an organic or conventional product, the brand, the package content, the number of packages purchased and the retail price in cents. The data also contained information on the week and year in which the product was purchased, as well as the distribution channel (as retailer or store format). The dataset only included unflavored milk, that is, milk without added flavors such as cocoa or strawberry, and did not include information about the milk's fat content. The data allowed a distinction to be made between different types of food retailing, such as discounters, drugstores, specialist retailers, full-range grocery stores, and hypermarkets. Forms of direct-to-consumer marketing, for example, farmers' markets or farm shops, were not included in the dataset.

Available sociodemographic information included in the dataset are at the household level and comprised data on the gender and age of the person who bought milk for the household, furthermore, the life situation, income, and region of the whole household. The federal states were divided into North Germany (Berlin, Brandenburg, Bremen, Mecklenburg-Western Pomerania, Lower Saxony, Saxony-Anhalt, Schleswig-Holstein, Hamburg) and South Germany (Baden-Württemberg, Bavaria, Saxony, Hesse, Rhineland Palatinate, Thuringia, Saarland, North Rhine-Westphalia). The size of their locations was split into small towns (fewer than 20,000 inhabitants), medium-sized towns (20,000–99,999 inhabitants), medium-sized cities (100,000–999,999 inhabitants), and large cities (more than one million inhabitants). Table 2 presents the subcategories used to structure these variables within the dataset.

TABLE 2 Descriptive statistics

Variables	All households $N = 16{,}841$ 100% Frequency	%	Farmstead dairy brand-buyers $n = 759$ 4.50% Frequency	%	Nonbuyers $n = 16{,}082$ 95.50% Frequency	%
Gender[a] (dummy variables)						
Male	3390	21.16	162	21.45	3228	21.15
Female	13,451	78.84	597	78.55	12,854	78.85
Age[a] (dummy variables)						
Under 30 years	812	4.82	29	3.82	783	4.87
30–39 years	2613	15.52	122	16.07	2491	15.49
40–49 years	4080	24.23	175	23.06	3905	24.28
50–59 years	4048	24.04	201	26.48	3847	23.92
60–69 years	3255	19.33	137	18.05	3118	19.39
Over 70 years	2033	12.07	95	12.52	1938	12.05
Life situation (dummy variables)						
Employed persons without children	2448	14.54	130	17.13	2318	14.41
Students	130	0.77	4	0.53	126	0.78
Unemployed	803	4.77	27	3.56	776	4.83
Empty nest families	3013	17.89	146	19.24	2867	17.83
Families with children	5541	32.90	248	32.67	5293	32.91
Retired	4906	29.13	204	26.87	4702	29.24
Household income (dummy variables)						
<1000 euros	1414	8.40	58	7.64	1356	8.43
1000–1999 euros	5569	33.07	230	30.30	5339	33.20
2000–2999 euros	5637	33.47	239	31.49	5398	33.57
Over 3000 euros	4221	25.06	232	30.57	3989	24.80
Location information (dummy variables)						
South Germany	11,882	70.55	243	32.02	11,639	72.37
North Germany	4959	29.45	516	67.98	4443	27.63
Small town	6825	40.53	250	32.94	6575	40.88
Medium-sized town	4677	27.77	209	27.54	4468	27.78
Medium-sized city	3977	23.61	151	19.89	3826	23.79
Large city	1362	8.09	149	19.63	1213	7.54
Household size (dummy variables)						
Single household	3674	21.82	182	23.98	3492	21.71
Two persons	7424	44.07	321	42.29	7103	44.17

(Continues)

TABLE 2 (Continued)

Variables	All households N = 16,841 100% Frequency	%	Farmstead dairy brand-buyers n = 759 4.50% Frequency	%	Nonbuyers n = 16,082 95.50% Frequency	%
Three persons	2952	17.53	121	15.95	2831	17.60
Four persons	2101	12.48	110	14.49	1991	12.38
Five or more persons	690	4.10	25	3.29	665	4.13

[a]These variables describe the characteristics of the person making milk purchases for the household.

Source: Authors' calculations based on GfK data (2012–2015).

TABLE 3 Descriptive statistics of milk price per volume of the different milk brand types

	Observations	Median[a]	Mean[a]	Std. Dev.[a]	Min[a]	Max[a]
Private label brands	1,537,097	59	62.29	14.27	19	195
Manufacturers' brands	277,159	99	99.97	25.09	25	495
Farmstead dairy brands	9911	109	103.95	17.75	33	175

[a]Values in euro cents per liter.

Source: Authors' calculations based on data from GfK (2012–2015).

The descriptive statistics (Table 2) show that 4.5% of the households purchased FDB milk during the data collection period. 78.8% of the consumers who purchased milk for their household in the dataset were female and 21.2% male, and revealed no differences between FDB buyers and nonbuyers. In terms of age, the majority of FDB buyers (26.5%) were aged between 50 and 59. Of the FDB buyers, 17.1% were employed persons without children, 0.5% were students, 3.6% were unemployed, 19.2% were empty nest families, 32.7% were families with children, and 26.9% were retired. The proportion of employed persons without children was greater among FDB buyers, while the proportion of retirees and persons without jobs was higher among nonbuyers. Of the FDB buyers, 7.6% had an income of less than 1000 euros, 61.8% had an income of between 1000 and 3000 euros, and 30.6% had an income of over 3000 euros. The proportion of consumers with an income of more than 3000 euros was higher among FDB buyers than among nonbuyers. The greatest difference between FDB buyers and nonbuyers was the region in which they lived. While 72.4% of nonbuyers lived in South Germany and just under 28% in the north, almost 68% of FDB buyers lived in the north and only 32% in the south. In terms of household size, just 24,0% of FDB buyers lived in single-person households, while 42.3% lived in two-person households. The share of single households is slightly lower among non-FDB buyers at 21.7%, while the share of two-person households is slightly higher at 44.2% among non-FDB buyers. Two-person households include both households with two adults and single parents with a child. Households with three or more persons account for about one-third of both the FDB buyer and the nonbuyer groups.

Table 3 and Figure 2 show the price per volume (ppv) of the different brands. The ppv corresponds to the milk price per liter in euro cents calculated from the dataset. Calculation of the ppv allowed prices to be compared because the dataset contained different sizes of milk packages. All observations with a very low ppv (ppv ≤ 45) or a very high ppv (ppv > 159) were checked. There were a total of 108,129 observations with a ppv less than or equal to 45. Of these observations, 96% (n = 104,234) were from 2012, where the share of private labels with a ppv of 45 was 99%. This means that the price at which discounters, full-range grocery stores and hypermarkets sold their private label milk for in 2012 was 45 cents. The other low observations (n = 3895) suggest that the milk was on

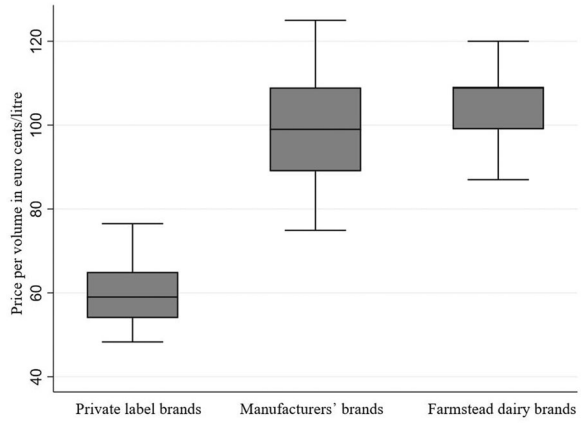

FIGURE 2 Box plot diagram of the price per volume of different types of brands (outlying observations omitted (mean ± 1 std. dev.). *Source*: Authors' calculations based on data from Gesellschaft für Konsumforschung (2012–2015).

TABLE 4 Comparison of the number of milk purchases of different brand types in various distribution channels

Distribution channel	Private label brands		Manufacturers' brands		Farmstead dairy brands		Total	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Discounter	930,280	60.52	35,600	12.84	630	6.36	966,510	52.98
Drugstore	472	0.03	2655	0.96	1	0.01	3128	0.17
Specialist retailer	9125	0.59	19,452	7.02	429	4.33	29,006	1.59
Full-range grocery store	326,737	21.26	139,263	50.25	7384	74.50	473,384	25.95
Hypermarket	270,483	17.60	80,189	28.93	1467	14.80	352,139	19.30
Total	1,537,097	100	277,159	100	9911	100	1,824,167	100

Source: Authors' calculations based on data from GfK (2012–2015).

special offer. A high ppv of more than 159 (n = 2718) can be explained by smaller packages of 200, 250, or 500 ml in 82% of the observations or purchases from specialist retailers.

Table 3 shows that the median, mean, and lowest ppv (min) were highest for FDB. The "min" value of 33 means that the cheapest FDB milk in the dataset cost 33 cents per liter and the highest price per liter was 175 cents. The box plot (Figure 2) shows that the FDB were slightly more expensive on average, but the variance in prices was less than for the other brands.

Table 4 shows the different distribution channels for milk. More than half of milk purchases were observed in discounters (53%), but only a small proportion of FDB milk was bought through this channel (6%). Three-quarters of FDB milk purchases were made in full-range grocery stores, although only about a quarter was sold via this sales channel. In addition to FDB milk, manufacturers' brands were also mainly sold through this channel, while private labels were mainly sold via discounters. The volume of milk is not substantially different from the number of purchases. In 50% of the observations, only one package of milk was purchased, which means that one observation corresponds to approximately 1 L of milk. In 25% of the observations, two packages were purchased, in another

10% three packages, and in another 14% up to 12 packages. Less than 1% of the observations show a higher number of more than 12 packages per purchase. For FDB, the number of purchases corresponds exactly to the volume of milk.

The total purchases of FDB were calculated over the observation period for each household. The results show that 759 households purchased an FDB product at least once during the observation period. Table 5 shows the number of purchases of FDB and the expenditure on FDB by all households in each year. The findings indicated that the number of purchases of FDB milk increased in that period, from 1934 in 2012 to 2915 in 2015. The same applied to expenditure on these products, rising from 2843 euros in 2012 to 4925 euros in 2015. Figure 3 shows the trend in total milk volume and FDB milk volume. While demand for milk generally decreased from 1.2 million liters to 1.1 million liters during the period under consideration, demand for FDB milk increased from 3000 to 4500 L. Hence, the demand for FDB milk increased by 150% from 2012 to 2015.

TABLE 5 Number of purchases and expenditures on farmstead dairy brands

	2012	2013	2014	2015
Number of all milk purchases	455,447	483,003	457,484	428,233
Number of purchases of farmstead dairy brands	1934	2391	2671	2915
Percentage of all purchases (%)	0.42	0.50	0.58	0.68
Expenditure on all dairy brands (in euros)	685,777	810,700	824,864	690,357
Expenditure on farmstead dairy brands (in euros)	2843	3934	4594	4925
Percentage of all expenditure (%)	0.41	0.49	0.56	0.71

Source: Authors' calculations based on data from GfK (2012–2015).

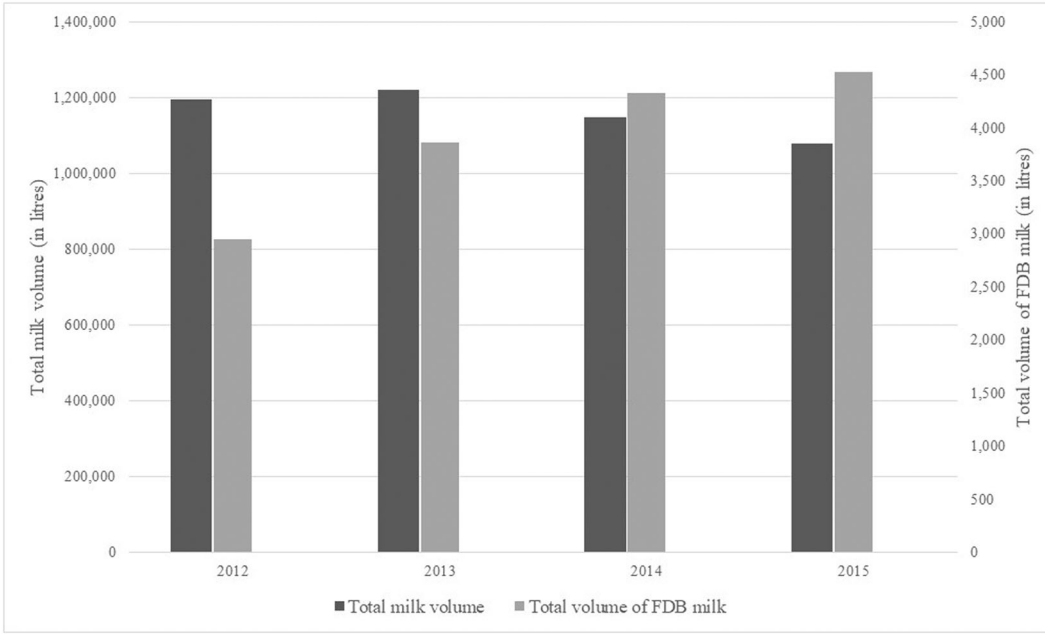

FIGURE 3 Comparison of total milk volume and Farmstead dairy brand milk volume from 2012 to 2015. *Source*: Authors' calculations based on data from GfK (2012–2015).

A major advantage of household data is that real purchases can be observed rather than hypothetical buying intentions. Furthermore, the dataset usually contained between "several" (n = 4) and "many" (n = 1222) observations per household over the 4-year period. A limitation with all household panel data, including this dataset, is a lack of information about the product range in the actual food retail selling situation, for example, whether the product was "on offer" or not.

4 | METHOD

To analyze the characteristics of FDB buyers, we use a zero-inflated negative binomial (ZINB) model, which is based on the purchase frequency of FDB milk. Observed purchases y_i were explained as a function of a vector of covariates x_i that captured the socioeconomic characteristics of the household and the geographical location. The covariates x_i included gender, age, income, organic buying behavior, and size of the location because other studies have shown these variables to have an influence on the demand for local food (e.g., Harwood & Drake, 2018; Khan & Prior, 2010) and an aim of this study was to establish whether they also have an impact on demand for FDB milk. Furthermore, the variables included different life situation categories and another variable related to a comparison of North Germany and South Germany. The distribution of farms that process and market their products is very heterogeneous in Germany (Böhm & Krämer, 2020), thus it could be assumed that there would also be regional differences in terms of demand for FDB milk. In the analysis of the influence of city size, variables with interaction effects were used. The variables for North Germany and place sizes were applied for this purpose since the descriptive statistics show that the majority of consumers were in the north of the country.

Observations from 2012 to 2015 were pooled because the number of households regularly purchasing FDB milk was very small. Overall, 759 different households purchased FDB milk at least once during the observation period. The number of households that purchased FDB milk in the different years varied from 281 to 389, but only 139 out of a total of 16,841 households purchased FDB milk every year in the 4-year period. The descriptive inspection of the data indicated that there may be a trend over time. To be able to examine this in the model, year dummies were created. These dummies had the value of one if a household bought at least one FDB milk in that year. Observations of FDB purchases from multiple years have been aggregated into a single cross-sectional number of FDB purchases per household. The potential distribution of these purchases over time has been controlled for through the introduction of time dummies, which can be justified by the very small overall number of FDB purchases. Due to this cross-sectional characteristic of our dataset, the autocorrelation is of no concern (Greene, 2012).

Variables that capture the occurrence of (usually small) discrete events can be modeled through count data models, such as Poisson and negative binomial models. For example, the consumption frequency of fruit/vegetables and snack items among primary schoolchildren can be a function of regional prices (Sturm & Datar, 2011). In the present study, a ZINB model (Greene, 1994; Mullahy, 1986) was used to analyze the purchase behavior of FDB milk in food retailing.

The analysis commenced with the standard Poisson regression model that explicitly considers the nonnegative integer aspect of the dependent variable, which is assumed to follow a Poisson distribution. The probability of an event number y_i being subject to a vector of covariates x_i is given by the following expression (Erdman et al., 2008):

$$P(Y_i = y_i|x_i) = \frac{e^{-\mu_i}\mu_i{}^{y_i}}{y_i!}, \quad y_i = 0, 1, 2, \ldots \tag{1}$$

where Y_i represents the count of purchases of FDB milk by an individual i during the observation period. A zero observation means that the household purchased milk during the period, in general, but no FDB milk. In

Equation (1), μ_i is the mean parameter (the conditional mean number of purchases of FDB milk) and is assumed to be a function of the vector of covariates:

$$E(y_i|x_i) = \mu_i = \exp(x_i'\beta), \tag{2}$$

where β is a $(k+1) \times 1$ vector of parameters to be estimated. The intercept is β_0 and the coefficients for the k covariates are $\beta_1, \ldots, \beta_k$. A distinct feature of the Poisson distribution is that the (conditional) variance and the (conditional) mean are equal. A generalization of the Poisson regression model is given by the negative binomial regression model that allows overdispersion (i.e., the data do not precisely match this feature of the Poisson distribution) by introducing an unobserved heterogeneity term for observation *i*. The negative binomial model is given by Equation (3),

$$E(y_i|x_i, \tau_i) = \mu_i\tau_i = e^{x_i'\beta}\tau_i, \tag{3}$$

where τ_i follows a gamma (θ, θ) distribution with $E(\tau_i) = 1$ and $V(\tau_i) = 1/\theta$. The assumptions included in both x_i and τ_i impose restrictions on the dependent count variable Y_i such that it will still follow a Poisson distribution; the conditional mean of the distribution is μ_i and the conditional variance is $\mu_i(1 + (1/\theta)\mu_i)$.

However, according to Lambert (1992) and Greene (1994), data collected within real-world (uncontrolled) environments often show overdispersion and excess zeros, which can be considered through an additional step that initially models the probability of a zero occurring in the dependent variable ("zero-inflated count models"). For this first step, a logit model was used to differentiate between zero observations for consumers who never buy FDB (certain zeros) and consumers who could have bought FDB, but did not, during the observed time period. Data in the present study shows that the variance exceeded the mean value (mean = 0.589; variance = 60.117) and was, therefore, potentially subject to overdispersion. In addition, there were about 95.5% zero observations included in the dependent variable (note that the dataset had 16,841 observations).

Zero-inflated count data models embrace two distinct data-generating processes for each observation (Erdman et al., 2008). For observation *i*, Process 1 is chosen with probability φ_i and Process 2 with probability $1 - \varphi_i$. The results of Process 1 are only zero counts, whereas the results of Process 2 are integer counts including zeros. Process 2, $g(y_i|x_i)$, generates counts from either a negative binomial or a Poisson model:

$$y_i \sim \begin{cases} 0 & \text{with probability } \varphi_i \\ g(y_i|x_i), & \text{with probability } 1 - \varphi_i \end{cases}. \tag{4}$$

The probability of $\{Y_i = y_i|x_i\}$ is:

$$P(Y_i = y_i|x_i, z_i) = \begin{cases} \varphi(\gamma' z_i) + \{1 - \varphi(\gamma' z_i)\}g(0|x_i), & \text{if} \quad y_i = 0 \\ \{1 - \varphi(\gamma' z_i)\}g(y_i|x_i), & \text{if} \quad y_i > 0 \end{cases}. \tag{5}$$

If the probability φ_i depends on the attributes of observation *i*, φ_i is written as a function of $z_i'\gamma$. z_i' is the vector of zero-inflated covariates and γ is the vector of zero-inflated coefficients to be estimated. The function F relates the product $z_i'\gamma$ to the probability φ_i and is called the zero-inflated link function. It can be declared as a logistical function ("logit") or alternatively as a standard cumulative normal distribution function (the "probit" function). This choice is generally considered to be insensitive with regard to estimation results.

The mean and the variance of the ZINB model are:

$$E(y_i|x_i, z_i) = \mu_i(1 - \varphi_i), \tag{6}$$

$$V(y_i|x_i, z_i) = \mu_i(1 - \varphi_i)(1 + \mu_i(\varphi_i + \alpha)). \tag{7}$$

The zero-inflated model shows overdispersion: $V(y_i|x_i, z_i) > E(y_i|x_i, z_i)$.

The Stata Version 17 program was used for the model's estimation.

The Vuong test was also performed to test whether a ZINB model would be more appropriate than a negative binomial model. The result was statistically significant, rejecting the null that both models are identical ($z = 29.66$; $p < 0.001$), and therefore, the ZINB model was selected. Furthermore, the likelihood-ratio test was used to check whether the zero-inflated Poisson model was better suited for the data than the ZINB model. The likelihood-ratio test was significant ($\overline{\chi}^2(01) = 21{,}000$; $p < 0.002$) and, therefore, the ZINB model turned out to be the model with the better fit. In contrast to a simple logit model, the ZINB model offered the advantage of the observations being analyzed in two steps, and a distinction was made between absolute FDB nonbuyers and potential FDB buyers in the case of zero observations.

The model was tested for correlations between the variables that appear in the model. Since all persons over 70 were retired, this age variable was not included in the model. For all other variables, all Spearman correlation coefficients were less than ±0.45, so there were only very weak or moderate correlations (Cohen, 1988) and multicollinearity does not pose a problem in the model as the corresponding VIF values are all <4. To account for possible heteroscedasticity in the data, a heteroscedasticity-robust Huber–White standard error was used in the model.

5 | MODEL RESULTS

The results of the ZINB count data model are presented below. The model is based on 16,841 observations, one for each household. A total of 759 observations are nonzero observations (4.5%) and 16,082 observations are zero observations (95.5%). The number of purchases of FDB milk is used as the dependent variable. The upper part of Table 6 shows the results of the logit estimations, while the results of the negative binomial models are presented in the lower part.

5.1 | Results of the logit model

The logit model predicts the probability of being in the group of absolute FDB nonbuyers. It distinguishes between zero observations for consumers who never bought FDB (certain zeros) and those who could, but did not, buy the brands during the observed time period.

The logit part of the model in the upper part of Table 6 shows significant positive coefficients for students, medium-sized towns, and medium-sized cities in North Germany. This means that students and households living in medium-sized towns or medium-sized cities in North Germany were more likely to belong to the group of absolute nonbuyers. In contrast, organic milk buyers and households living in sparsely populated regions in North Germany were less likely to be absolute nonbuyers because of the significant negative coefficients shown by the model.

Table 7 shows the marginal effects of these significant variables on the probability of never buying FDB milk. The probability of being an absolute FDB nonbuyer was 10.7% higher for a student than for employed persons without children. Similarly, the probability of being an absolute nonbuyer was 1% higher for consumers living in medium-sized towns or medium-sized cities in North Germany. In contrast, consumers in other locations in North Germany were less likely to belong to the group of absolute nonbuyers. Those who regularly bought organic milk were also less likely to be in the absolute nonbuyer group compared to nonorganic buyers. Another result is the newly added time trend which is statistically significant. This means that the probability of never buying FDB milk decreased from year to year. In contrast to these significant influences on the probability of never buying FDB milk, other variables such as gender, age, income, and other life situation categories had no significant influence.

TABLE 6 Farmstead dairy brand milk purchases: Results of a zero-inflated negative binomial count data model

	Parameter estimates	Significance	*z* value	Robust standard errors
Logit model				
Female	−0.178		−0.54	0.329
30–39 years	0.039		0.07	0.530
40–49 years	0.795		1.48	0.537
50–59 years	−0.032		−0.06	0.486
60–69 years	0.065		0.16	0.405
1000–1999 euro	−0.888		−1.34	0.661
2000–2999 euro	−0.257		−0.38	0.685
3000 and more	−0.396		−0.57	0.694
Retired	0.343		0.70	0.490
Unemployed	−0.242		−0.33	0.728
Students	18.294	***	35.52	0.515
Empty nest family	−0.317		−0.73	0.435
Family with child	−0.167		−0.41	0.409
Organic buyers	−1.621	***	−5.36	0.303
North Germany	−1.685	***	−6.68	0.252
Medium-sized town (North Germany)	1.139	**	2.34	0.486
Medium-sized city (North Germany)	0.942	*	1.75	0.540
Year 2013	−28.865	***	−127.60	0.226
Year 2014	−28.814	***	−123.89	0.233
Year 2015	−42.540	***	−38.99	1.091
Constant	6.387	***	8.26	0.773
Negative binomial model				
Female	−0.198		−1.07	0.185
30–39 years	0.196		0.54	0.359
40–49 years	0.786	**	2.53	0.311
50–59 years	0.189		0.59	0.318
60–69 years	−0.422		−1.36	0.310
1000–1999 euro	0.326		1.12	0.292
2000–2999 euro	0.382		1.41	0.270
3000 and more	0.573	**	2.01	0.284
Retired	0.899	***	3.13	0.288
Unemployed	−0.759	**	−2.06	0.368
Students	−0.441		−1.23	0.360

TABLE 6 (Continued)

	Parameter estimates	Significance	z value	Robust standard errors
Empty nest family	0.148		0.56	0.265
Family with child	0.084		0.32	0.263
Organic buyers	0.754	***	4.28	0.176
North Germany	0.317		1.52	0.208
Medium-sized town (North Germany)	0.469	*	1.72	0.273
Medium-sized city (North Germany)	0.386		1.54	0.251
Constant	1.107	***	2.98	0.372
/lnalpha	0.679	***	12.55	0.054

Note: Wald $\chi^2(17) = 102.37$ (Prob > $\chi^2 = 0.0000$). Dummy variables omitted from the calculations: male, younger than 30 years, less than 1000 euros, employed persons without children, South Germany, small town, the year 2012. Number of observations = 16,841, nonzero observations = 759; zero observations = 16,082.

*Significance at $\alpha < 0.10$.

**Significance at $\alpha < 0.05$.

***Significance at $\alpha < 0.01$.

Source: Authors' calculations based on data from GfK (2012–2015).

TABLE 7 Influence of different variables on the probability of never buying FDB milk

Margins	*dy/dx*	Significance	z value	Standard errors
Students	0.107	***	7.82	0.014
Organic buyers	−0.010	***	−4.66	0.002
North Germany	−0.010	***	−5.32	0.002
Medium-sized town (North Germany)	0.006	*	2.24	0.003
Medium-sized city (North Germany)	0.007	**	1.70	0.003
Year 2013	−0.169	***	−8.78	0.019
Year 2014	−0.169	***	−8.78	0.019
Year 2015	−0.250	***	−8.33	0.030

Abbreviation: FDB, Farmstead dairy brand.

*Significance at $\alpha < 0.10$.

**Significance at $\alpha < 0.05$.

***Significance at $\alpha < 0.01$.

Source: Authors' calculations based on data from GfK (2012–2015).

5.2 | Results of the negative binomial model

The negative binomial regression model estimates FDB purchases among potential FDB buyers. It shows the influence of the different variables on the expected number of purchases of FDB milk for consumers who were not in the group of absolute nonbuyers (i.e., who were unlikely to represent certain zeros).

The results indicate that individual life situations had an influence on the expected number of FDB purchases. The regression results (Table 6) show that among FDB buyers, consumers who are retired purchased FDB milk more

often than employed persons without children. The expected number of FDB milk purchases increased by a factor of 2.5 (exp(0.899) = 2.5; $p < 0.003$) for retired consumers compared to employed consumers which means that the expected number of FDB milk purchases was 2.5 times higher than for the reference group. In contrast, the group of consumers without a job but of working age bought FDB milk less often than the reference group of employed consumers without children. For those without a job but of working age, the expected number of FDB milk purchases fell by almost 50% (exp(0.759) = 0.47; $p < 0.04$). For the other life situation categories, students and families with and without children, there are no significant differences compared with the reference group.

Income also seems to have an influence. Compared with the reference group defined as individuals who had an income of less than 1000 euros per month, consumers with a high income of more than 3000 euros per month bought FDB milk more frequently. The expected number of FDB milk purchases was 1.8 times higher for consumers with a high income of more than 3000 euros per month than for the reference group (exp(0.573) = 1.8; $p < 0.045$). In addition, the results show a significant and positive coefficient for middle-aged consumers. Consumers aged between 40 and 49 bought FDB milk more often for their households than the reference group aged under 30, the expected number of FDB milk purchases is 2.2 times higher for this group (exp(0.786) = 2.2; $p < 0.012$). For the other age groups, there are no significant differences compared with the reference group.

Another influence on the frequency of FDB milk purchases seems to be the attitude toward organic milk. Among the group of individuals observed to buy FDB milk, the number of purchases was higher among those who regularly bought organic milk. The expected number of FDB milk purchases increased by a factor of 2.1 (exp(0.754) = 2.1; $p < 0.001$) for organic milk buyers compared with consumers who always bought conventional milk. Furthermore, the model shows a significantly positive coefficient for households living in medium-sized towns in North Germany, the expected number of FDB milk purchases increased by a factor of 1.6 (exp(0.469) = 1.6; $p < 0.087$) for this group compared with households from other regions. No influence on FDB purchases could be determined for the other location variables or gender.

In summary, the results of the negative binomial model show that consumers who belonged to the group of FDB milk buyers bought these brands more often if they were middle-aged or retired, had an income of more than 3000 euros per month, regularly bought organic milk or lived in medium-sized towns in North Germany. In contrast, consumers in this group bought FDB milk less often if they were unemployed.

6 | DISCUSSION

Purchases of FDB milk increased year on year for the average individual in the sample, indicating that FDB are able to compete against the overall trend of declining per capita milk consumption in Germany. Demand for FDB milk increased by 150% between 2012 and 2015 and is expected to continue to increase due to the high demand for regional foods overall.

The results of the ZINB regression model show that different characteristics are related to buying behavior. The group of absolute nonbuyers of FDB milk tends to include students in general, respondents in medium-sized towns or cities in North Germany, and respondents in South Germany in general.

Students may belong to the nonbuyer group either because they prefer to buy cheaper goods and, therefore, choose private milk labels, or they may prefer organic products. We note in this context that FDB milk is instead mostly conventional. To test whether FDB milk is primarily not purchased by students who buy organic milk, the model was estimated with an additional "organic student" variable. This "organic student" variable was an interaction effect and showed a value of one if the buyer was a student and also regularly purchased organic milk. The results show significant results in both the logit and negative binomial regression parts. The probability of being an absolute FDB nonbuyer was 10.7% higher for a student and 30.7% higher for an "organic student" than for employed persons without children. When "organic students" purchased FDB milk, the expected number of FDB milk purchases was lower than for employed persons. These results thus show that there are two different groups

of students. One group that is particularly price-sensitive, probably has little interest in regional products and, therefore, tends to reach for cheap private milk labels, and another group for which the characteristic "organic" is more important than regional origin. Overall, it appears that students are not part of the FDB buyer group.

In contrast to students who buy organic milk, other organic buyers were significantly less likely to be in the absolute FDB nonbuyer group. This group of organic buyers also show a greater frequency of purchases of FDB milk. This increased interest in regional products among organic buyers is in line with the results of Zepeda and Deal (2009), who analyzed the behavior of buyers of organic and regional products. One finding of their study was that organic buyers are increasingly switching to regional products because they reject the increasing commercialization of organic food and industrialization of organic farming practices (Zepeda & Deal, 2009).

City size may explain why consumers living in medium-sized cities compared to small cities tend to have less contact with regional agriculture and thus feel a lower attachment to it. At the same time, the results show a higher purchase frequency of FDB buyers living in medium-sized towns. This supposed contradiction points to a heterogeneous structure of the population in medium-sized towns. One subgroup of the population does not seem particularly interested in agricultural products in the region, nor in its products. Another subgroup likely buys products that come from their own region because it gives them a sense of home or as a backlash to globalization.

One possible explanation for the influence of the variable "North Germany" in the logit part of the model could be that the structures in North Germany differ from those in South Germany. In South Germany, dairy processors who focus on the domestic market with premium products are much more common. Furthermore, FDB milk in South Germany is less likely to be sold in supermarkets and more likely to be sold in farm shops and other forms of direct-to-consumer marketing in a system that is more widely developed in the south of the country (Destatis, 2021).

For some life situations, an influence on the purchase frequency of FDB milk could be found. Retirees bought FDB milk more often. The result is in line with other studies in which older consumers in particular have a positive attitude to regional products (e.g., Khan & Prior, 2010). This result might be explained by the fact that older consumers have a greater connection with where they come from. They know food from small producers from when they were young, have deeper roots in their home region, and therefore, have a positive attitude to regional products (Henseleit et al., 2007). The results also show a higher number of FDB purchases by middle-aged consumers. This result is in agreement with other studies that have also analyzed the influence of age on the demand for regional products (e.g., Khan & Prior, 2010).

Income had no significant effect on whether a household was among the absolute nonbuyers of FDB or not. However, for all observed individuals except absolute nonbuyers, the results show that consumers with a high income of more than 3000 euro per month tended to purchase these brands more often. This result is consistent with other studies that have also described high income as a characteristic of consumers who have a positive attitude toward regional food (e.g., Khan & Prior, 2010). Consistent with this result, unemployment was shown to have a negative impact on the frequency of purchase of FDB milk. Consumers without jobs but of working age were less likely to buy FDB milk than consumers who have jobs. One possible explanation may be the low income associated with unemployment and some consumers perceiving regional products to be expensive or even very expensive (Chambers et al., 2007). In contrast with other studies that have identified a positive influence of the female gender on the purchase probability of local products (e.g., Jensen et al., 2019), the models in the present study showed no effect.

7 | CONCLUSIONS

The purpose of the current study was to determine the characteristics of German consumers who purchased milk from FDB in food retailers. Taking data from the German household panel of the GfK, a ZINB model was used for the analysis. Previous studies on buyers of regional milk have been based on consumer surveys or scanner data, so

this study is the first to analyze the characteristics of buyers of regional milk brands on the basis of actually observed purchasing behavior and helps to fill this research gap.

The results show that organic buying behavior, student status, and place of residence were dominant factors that influenced whether FDB milk was purchased at all. Middle-aged and high-income FDB milk buyers showed a higher purchase frequency, as did consumers who regularly bought organic milk or were retired. In contrast, the results show a lower purchase frequency for unemployed but of working age individuals. Another important result is the clear trend over time that contrasts with the decreasing demand for milk overall.

Milk from FDB is a small but successful and growing niche in food retail. The demand for regional products is increasing and milk from farmstead dairies is in keeping with the trend for regional products. Consumers are demanding more and more of these products every year and are willing to pay higher prices. Grocery stores in smaller towns in North Germany are attractive food retailing markets for milk from FDB, but it is suspected that in South Germany FDB milk has so far been marketed through other sales channels. Thus, the food retail trade there could also represent a successful sales channel in future. This channel so far seems to be barely used and could be considered a small market segment with opportunities for growth.

For dairy farmers, this may present an opportunity to benefit from a WTP for products from their farms, even though this comes with the risk of specific investments required in farm-based dairy processing. The findings in this study, therefore, have some important implications for the marketing of FDB milk and could also provide information for dairy farms about the prospects of farm-based marketing of their own dairy brands in their immediate vicinity.

However, even though the demand for FDB milk is increasing and benefiting from the growing demand for regional products, this is no guarantee of success. FDB milk needs a convincing marketing concept to establish itself in the market and prevail against the multitude of other established brands from large-scale dairy processors. Identified as an important success factor in this study, brand names with a regional reference should be used and the packaging should clearly indicate that its contents come from a farmstead dairy.

A limitation of our study, as well as all other studies based on household panel date, is a lack of information about the product range in the actual food retail selling situation, for example, whether the product was "on sale" or not, and which milk brands were available in the product range. Furthermore, the dataset did not include information on whether consumers recognized milk from farmstead dairies indeed as "local brand," since many other dairies also used regional brands and labels to advertise on their packaging.

This study is the first to analyze the characteristics of FDB buyers using household data, and our findings point to further interesting research questions: For instance, it would be interesting to explore whether shopper characteristics have changed in recent years and how the demand and supply of FDB in the retail trade have evolved.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from Gesellschaft für Konsumforschung. Restrictions apply to the availability of these data, which were used under license for this study.

ETHICS STATEMENT

The data used in this study was acquired from Gesellschaft für Konsumforschung (GfK), which itself subscribes to high ethical standards. In the course of the procurement process, ethical requirements were considered as part of the legal requirements for the federal procurement procedure. GfK's data collection requires voluntary reporting by the participants.

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