Consumption of organic meat products in France: An analysis based on panel data (scanner dataset)

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Abstract

The consumption of organic meat products has been characterized using the Kantar Worldpanel data collected from 2012 to 2014. Based on the price of the total quantity purchased and the amount spent on each purchase, several indicators were calculated and their values compared between organic households (OHs) and nonorganic households (NOHs). OHs were characterized according to sociodemographic and attitudinal variables. Finally, a logit model was constructed to determine the likelihood of belonging to the organic household category. Consumption is low in terms of the proportion of households that purchase organic meat (O-ME) and meat products (O-MPs), the average quantity purchased per year and per purchasing household (2 kg and 0.9 kg respectively), and purchasing frequency. These values are below those reported by questionnaire surveys which can be attributed to an attitude-behavior gap. The main organic meat products purchased are bovine meat and pork processed products. Moreover, being part of a family with children and living in a big city increase the probability of purchasing O-ME and O-MPs.

Keywords*: organic, meat, consumption, panel, France.*

1. Introduction

The European market for organic products is thriving. The Research Institute of Organic Agriculture (FiBL) and IFOAM_Organics International report that it stood at €26.2 billion in 2014, which was 7.6% up on the previous year (Vermeir and Verbeke, 2006; Willer and Schaack, 2016). This growth is made possible by increases in the arable land given over to organic farming (5.1 million hectares in Europe including 4.1 million in the European Union in 2014), in the number of producers and processors (260,000 and 50,000 respectively in the EU in 2014) and in trade both within the community and with third countries.

Following this trend, the French market for organically-farmed foodstuffs is also booming (+10% per year on average over the period 1999-2015) as it is in most developed countries. The Agence Bio (2016) reports that it amounted to €5.5 billion including VAT in 2015, 88% of which was household consumption at home, making it the second largest market in Europe after Germany. This growth has been made possible by the extension of traditional distribution channels (specialist channels and outdoor mar-

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kets, and direct sales) to hyper- and supermarkets. Accordingly, the consumption of organic products by households at home is thought to represent some 2.5% of the food market by value – *i.e.* ranking only eighth in the European Union (Willer and Schaack, 2016) – with very variable market shares depending on the products in question. Although sales of meat products are growing rapidly, the figures remain modest (Agence Bio, 2016): in 2014, the biggest markets in this category were for bovine meat (€205 million), ahead of poultry (€145 million), and pork charcuterie (€96 million), which correspond to 2.2%, 0.5%, and 2.3%, respectively, of the total value of those products consumed by households (Agence Bio, 2014). The growth of the market is keeping pace with the increased tonnages of organic meats produced in France (27,500 tonnes carcass weight equivalent - t cwe - for butcher's meat in 2014 versus 24,500 t cwe in 2012) (Interbev, 2016). The limited scope of meat and meat products within the market for organic products is not peculiar to France. Although it is difficult to provide precise and reliable figures in the absence of any unified mechanism for collecting data, the market share in terms of the value of organic meat and meat products is less than 5% in EU countries for which information is available, which is well behind eggs, fruit and vegetables, and dairy products (Willer and Schaack, 2016). Moreover, in a survey of 817 consumers in Germany in 2008, meat topped the list of products for which respondents said they did not generally buy organic (58.3% for meat without poultry and cut meats, 57.3% for cut meats, 46% for poultry without cut meats versus 10.4% for pasta for example) (Buder *et al.*, 2014). The dearth of knowledge about the motivations and curbs for purchasers of organic meat products and their sociodemographic profile makes it worth looking into this emerging market.

The present study is an extension of recent work (Hemmerling *et al.*, 2016; Janssen, 2018; Schäufele and Hamm, 2018) combining a questionnaire-based survey (designed to reveal purchasing intentions or attitudes) and actual purchases by the same panel of consumers. It seeks to characterize the purchasing behavior of households that buy organic meat products (fresh and frozen meat and processed meat products,[1] respectively O-ME and O-MPs hereinafter) and their sociodemographic characteristics by using panel data, as in earlier works on the consumption of organic products of animal origin (Anders and Moeser, 2008; Monier *et al.*, 2009; Marian *et al.*, 2014). This characterization is coupled with the exploration of the attitudes of the same buyers with respect to the quality of organic products, their willingness to pay a surplus for these products, and their sensitivity to environmental and health protection. It is hypothesized that socio-demographic variables and household attitudes influence the decision to purchase O-ME or O-MPs.

2. Literature review

Numerous studies have sought to identify what drives the consumption of organically-farmed products. A recent meta-analysis by Massey *et al.* (2018) compiles the results from 124,000 respondents in 150 papers published between 1991 and 2016. Taking as their starting point the observation that consumers are turning in increasing numbers to organically-farmed products despite there being little evidence of their superiority with respect to most of the claims used to sell them, they analyze the factors behind such behavior using two types of indicators (derived from those in the original publications): (i) the proportion of consumers who think organic products are superior to conventional ones and (ii) an average score reflecting a level of agreement on a 7-point scale. The two indicators are used to evaluate 12 factors: seven credence attributes (*health benefit, health safety, environmental impact, animal welfare, production system, nutritional value, and quality*), three search attributes (*higher prices, product availability, and appearance*), and two experience attributes (*taste, freshness*). The results show that

[1] Processed meat from pigs or poultry (ham, bacon, sausages, etc.) whether it is industrial or artisanal.

while all three attribute classes are important, more consumers think organic products are superior in terms of credence attributes (66% for *health benefit*, 62% for *health safety* and *quality*, and 57% for *environmental impact*) than is the case for experience attributes (45% for *taste*) or search attributes (42% for *appearance*). In addition, the intensity of perception (reflected by the average score) is also higher for credence attributes. Furthermore, purchasing behavior is closely tied to people's positive perception of organic products. For example, attributing a high score to *nutritional value* and *taste* is associated with a sharp rise in intention to buy. This rise is lower for *environmental impact* and *health* attributes. Conversely, intention to buy declines when product *availability* is questioned, which is not the case with the *higer price* attribute. This suggests accessiblity is the main barrier to purchasing organic products.

The growing craze for organic products reflects a change in consumer attitudes. By using the theory of planned behavior model (Ajzen, 1991), Scalco *et al.* (2017) confirm in their meta-analysis the preponderant role of attitudes, alongside subjective and perceived behavioral control norms, in explaining the intention to purchase organic products and then in the actual purchasing behavior: intention to buy remains the best predictor of actual purchases. The recent review of the literature by Rana & Paul (2017) underscores that sensitivity to environmental protection, the search for products that are safe and of high quality, and the concern for health are the driving forces behind consumption of these products, the respective importance of which varies according to the category of products under study and by country. Moreover, the boundary between different attitudes is sometimes fine and this "categorization" differs among consumers: through focus groups of Danish citizens, Ditlevsen *et al.* (2019) show that health concerns may be associated with the nutritional value of products and with sensory pleasure related to their consumption and to their purity, all of which are attributes that might be related to other types of attitudes such as protection of the environment or quality. Lastly, the consumption of organic products is associated with an increase in the subjective well-being of consumers, which can be explained by the individual's belief about having a healthy diet which is both positively moderated (indirect effect) and directly positively moderated by concern for health (Apaolaza *et al.*, 2018).

The positive evolution of consumer attitudes towards environmentally-friendly products (which include organic foods) and the stated (or self-reported) behavior is not always materialized in actual purchases, however, because of the well-known attitude-behavior gap (Vermeir and Verbeke, 2006) or the self-reported-actual behavior gap (Moser, 2016a; Moser, 2016b). Janssen (2018) argues that these gaps can be explained by three biases affecting responses to questionnaire surveys: (i) social desirability that prompts consumers to say they are prepared to buy organic products because it is socially the well-perceived thing to do (Kim *et al.*, 2018); (ii) the acquiescence bias characterized by the fact that a respondent will tend to agree with others; and (iii) the consumer confusion bias resulting from the fact that some respondents who are not very familiar with organic labeling declare they buy organic products whereas the products are actually conventional ones. These biases argue for the use of an approach combining a questionnaire-based survey and actual purchases.

While organic product consumption has been widely studied, meat has seldom been used as an example particularly because the market has been late developing. France is no exception here: the few available studies are based on estimates of market value (Agence Bio, 2016) or unsystematic surveys of household samples. As regards the proportion of purchasing households, a survey of a representative sample of the French population conducted among 1,044 individuals in March 2015 indicates that 59% of respondents stated that "they occasionally ate organic meat". Of this number, 22% intended to increase their consumption of organic meat in the coming months (and 73% to keep the level unchanged) (Ifop, 2015). Another study for the Agence Bio as part of a barometer of consumption and perception of organic products conducted on a sam-

ple of 1,007 people representative of the population of France indicated that 39% of organic consumers (25% of the total sample) stated they ate organic meat; 30% referred to poultry, 20% to beef or veal, and 16% to pork, processed meat products, and lamb (Agence Bio, 2015). To the question "What proportion of your consumption of these products is organic?", 41% of purchasers of organic poultry and 39% of purchasers of beef and veal replied that more than half was. As for the frequencies of purchase of organic meat products, to the question "Do you ever eat organic meat?" asked as part of the Ifop 2015 study, 2% of respondents stated they ate only organic meat, 16% "when they could find it", and 41% "seldom". Moreover, exploitation of data collected from a cohort of consumers as part of the French Nutrinet[2] program provided supplementary results: 91.6% of consumers who purchased organic products (of all food types) stated they ate organic meat. For 15.9% of them, at least 50% of their meat consumption was organic and for 1.8% they ate organic meat exclusively. Similar percentages were obtained for meat-based processed products (including charcuterie).

3. Materials and methods

3.1. *Dataset presentation*

The original data set is based on the records of a consumer panel of French households collected by Kantar Worldpanel. It is a home-scan data set providing detailed information about all food product purchases. Among other things, the data set provides the characteristics of the good (e.g., brand, size, regular or diet product, organic or conventional), quantities purchased, and related expenditures for each household. The data set also provides information on each household's socioeconomic characteristics, such as its demographic composition, socioeconomic status and income class. In order to analyze consumption practices related to organic meat (O-ME) and organic meat products (O-MPs), food purchases in 2012, 2013 and 2014, were considered. Among the purchases, those concerning ME and MPs were selected, which represent approximately 1 million purchases each year for 6,000 to 6,500 purchasing households. The latter are households having reported purchases for at least 11 of the 13 periods (the year is divided into 13 four-week periods) of the year in question, 3,583 of which are common to the three years under consideration. This panel, representing some 11 million purchases each year, is constructed in such a way that it can be extrapolated to the entire population of France (Table 1).

It is representative of that population for the variables of household size, wealth, age of panelist, socio-occupational category, home region, and size of district. To ensure this representative character, each household is given by Kantar a monthly and annual weight (or correction factor).

3.2. *Quantitative data processing*

The range of ME and MPs was formed by collecting some 21,000 product references from the Kantar base that could be connected with it. Then a finer subdivision was proposed so as to individualize 12 subgroups of products (Table 2).

Lastly, organic product purchases were characterized by using an indicator variable in the database ("organic" variable). This information made it possible to classify households as "organic households" (OHs) and "non-organic household" (NOHs) depending on whether or not they had purchased at least one organic meat product (O- ME or O-MPs) in the year. Based on the price of the total quantity purchased and the amount spent on each purchase and the annual weight of each household in the panel, calculations were made of the number of purchasing households, the average number of purchases, the average quantities purchased per purchasing household, and the average prices for each of the groups (ME and MPs) and subgroups of

[2] On-line questionnaire on the frequency of consumption of organic products, conducted on 28,745 subjects (20,980 women and 7,265 men). As the sample was not representative of the population of France, the authors corrected the sample for the respondent's sex.

Table 1 - Descriptive data of the databases used.

	2012	*2013*	*2014*
Number of purchases for the subpanel	11,533,175	11,925,410	12,511,985
Number of households in the subpanel	12,339	13,381	13,388
Number of purchases of meat (ME) and meat products (MPs) by purchasing households over the period	1,082,462	1,025,520	1,120,909
Number of different ME and MPs items purchased annually by all purchasing households for the year	20,732	21,357	22,253
Number of purchasing households over the period	6,261	6,040	6,565

Table 2- Number of purchases and average price by product category in 2014.

Product subgroup	*Observed purchases*				*Average price (€/kg)*		*Δ Organic/ Non-organic prices (%)*
	Total	*%*	*Org*	*%*	*Non-org*	*Org*	
Beef	155,277	13.85	1,493	25.08	12.1	16.3	34
Veal	35,397	3.16	82	1.38	15.4	25.0	63
Sheep	18,509	1.65	47	0.79	14.2	22.2	56
Pork	80,292	7.16	81	1.36	8.0	15.6	95
Poultry	135,148	12.06	397	6.67	8.7	14.6	67
Other meat and mixed	20,987	1.87	7	0.12	13.1	7.9	-40
Pork ham	213,568	19.05	1,509	25.35	12.8	30.0	134
Other pork processed products	294,454	26.27	1,741	29.25	9.6	16.3	71
Poultry ham	34,833	3.11	119	2.00	11.9	27.3	129
Other poultry processed products	32,141	2.87	45	0.76	20.7	19.3	-7
Other unspecified processed products	69,528	6.20	334	5.61	10.6	16.5	56
Other processed products, other meat and mixed	30,775	2.75	98	1.65	12.4	23.0	85
Total	1,120,909	100. 00	5,953	100. 00			

products. Because of the low number of purchases for certain subgroups of products, the analysis covered groups only (ME and MPs). As the numbers of purchases and quantities do not follow a Gaussian distribution, a non-parametric (Kruskal-Wallis) test was used to compare the means between organic and non-organic households.

3.3. *Household characteristics, attitudes, and behavior*

Households that purchased O-ME and O-MPs were characterized according to certain sociodemographic variables in the Kantar base[3] and their attitudes were characterized according to four factors: the quality of organic products, their willingness to pay more for them, their concern for protecting the environment, and their concern for health. This was done by using the responses to four variables in the "lifestyle" survey that Kantar conducts annually among the households of the purchasing panel (four-point scale from "I strongly disagree" (1) to "I strongly agree" (4)). Ward's linkage method was used to determine the optimal number of clusters (using Duda-Hart criteria) then a k-means clustering method (single linkage) was applied and the variable from the clustering included in the analysis. Because of the imbalance between the number of organic and non-organic households and the limited numbers of the former, the analysis was conducted by combining the two groups of products. A Chi-square test was used to determine whether the organic and non-organic households differed in terms of these sociodemographic and attitude variables. Moreover, the average annual number of purchases was compared depending on whether the household belonged to one or other cluster and on the responses to the four variables used to form them, taken independently (ANOVA followed by pairwise comparisons of means, Tukey-test).

Then a logit model was constructed to determine the likelihood of belonging to the organic household category. The sociodemographic variables and the one resulting from the clustering concerning attitudes were introduced stepwise: each time a variable was added, the two models (before and after inclusion) were compared by a likelihood ratio test (lrtest under Stata 14, Likelihood Ratio test). The variable was kept only if the test proved significant. The quality of the model was evaluated by the Akaike information criterion (AIC). The AIC was also used on the final model selected to measure the relative importance of each variable (*lrdrop1* under Stata14): a variable is more important in the model if the AIC variation is high when the variable is removed (Afsa, 2016). All statistical processing was done with Stata 14 software.

4. Results

4.1. *Number and places of purchases, number and proportion of purchasing households*

Purchases of organic products were very low for both product groups (0.34 to 0.57% of the total) although they rose slightly over the period 2012-2014 (Table 3).

Three subgroups accounted for more than 75% of the 5,953 purchases observed for organic products (Table 2): these were *other pork processed products* (29.25%), *ham* (25.35%), and *beef* (25.08%). The weight of these three subgroups in the set of purchases was greater for organic than non-organic products. The same did not hold for the fourth subgroup which was the largest for organic products, namely *poultry meat*.

For the three years under study, purchases were made mostly in hyper- and supermarkets (72% in 2014 versus 86.9% for non-organic products). Specialist shops represented 23.7% of purchases of these products and substituted for butcher's, charcuterie sellers, and delicatessens that featured in the non-organic purchases.

The proportion of households having bought an organic product at least once in the year (OHs) was also small but differed between O-ME (6-7% of purchasing households) and O-MPs (12%) (Table 3). Only the categories

[3] The following sociodemographic variables were used: household income band, occupation and socio-occupational category of the head of the household (that is the man for a couple or a single man with or without children and the woman if alone, with or without children), educational level, age group, household with children under 3 years of age, household with children under 16 years of age, household's life-cycle stage, size of the urban unit where the household lives, and region of residence). Categories of each variable are shown in Table 6.

Table 3 - Number of purchases and number (and percentage) of purchasing households by product group.

	2012		2013		2014	
	N.	%	N.	%	N.	%
Number of purchases						
Organic meat (O-ME)	1,520	0.34	1,613	0.39	2,107	0.47
Non-organic meat (NO-ME)	440,017	99.66	410,727	99.61	443,503	99.53
Organic meat products (O-MPs)	3,276	0.51	3,178	0.52	3,846	0.57
Non organic meat products (NO-MPs)	637,649	99.49	610,002	99.48	671,453	99.43
Purchasing households						
O-ME	403	6.44	392	6.5	454	6.92
NO-ME	6,225	99.53	5,992	99.4	6,518	99.39
O-MPs	737	11.78	726	12.04	780	11.89
NO-MPs	6,242	99.81	6,019	99.82	6,543	99.77
O-ME or O-MPs	981	-	-	937	1. 011	-

other pork processed products, *beef*, and *ham* exceeded 200 purchasing households per year for organics (data not shown here). The proportion of purchasing households ranged from 0.1% (*Other meat and mixed*) to 7.9% (*Other pork processed products*). These proportions varied little over the three years under study.

4.2. *Purchasing frequency*

On average, purchasing households bought (non-organic or organic) ME or MPs 170.9 times in 2014, composed of 67.9 purchases of ME and 103.0 purchases of MPs. The total average number of purchases was significantly higher for organic households (179.4) than for non-organic households (169.4) (Kruskal-Wallis test, p = 0.0019) (Table 4). The same was true for the number of purchases of ME (p = 0.0001). Conversely, the number of purchases of MPs did not differ between the two groups (p = 0.07).

Among these, the number of purchases of O-ME and O-MPs was low. In 2014, the 1,011 organic product purchasing households made on average 2.1 purchases per year of O-ME and 3.8 of O-MPs (Table 4). For households that bought O-ME (n = 454), this average stood at 4.6 per year but half of them made only two purchases and 75% of them only three. The situation was similar for households that bought O-MPs (n = 780): the average number of purchases was 4.9 per year, the median was 1 per year, and 75% of households made no more than four purchases per year.

Table 4 - Number of purchases of meat and meat products, by organic and non-organic households in 2014.

	Non-org household	*Organic household*
Number	5,547	1,011
Number of purchases (organic and non-organic) (/year)**[(1)(2)]	169.4	179.4
*Meat (ME)****	67.0	73.0
Processed meat products (MPs)	102.4	106.4
Number of organic purchases (/year)	-	5.9
ME	-	2.1
MPs	-	3.8

(1) Unweighted data.
*(2) Kruskal-Wallis test, ***: p<0.001; **: p<0.01; *: p<0.05.*

Accordingly, the proportion of purchases of organic meat products among all purchases of these products (organic and non-organic) for purchasing households in this category was low: it stood at 9.1% for ME (percentile25 = 1.6; p50 = 3.2, and p75 = 8.3) and 7.2% for MPs (p25 = 0.9; p50 = 1.7, and p75 = 4.8).

Of the 1,011 households that bought O-ME or O-MPs in 2014 (that is, 15.4% of households), 788 (that is, 12% of the total sample and 78% of households that bought O-ME or O-MPs) bought just one of the product groups and 223 both. These proportions did not differ significantly over the three years under study.

Lastly, on average NOHs made 17.2 purchases of organic products (counting all food categories) in 2014 versus 110.5 for OHs. For both types of households, the average number of acts of purchase rose slightly between 2012 and 2014.

4.3. *Quantities bought*

Table 5 sets out the total average quantities bought by purchasing household of ME and MPs by organic (OHs) or non-organic (NOHs) type of households for 2014.

The average quantity bought per purchasing household was 81.3 kg, 50.5 kg of which was ME and 30.8 kg MPs. The total difference in quantities bought between OHs and NOHs came within the 95% confidence interval (p = 0.05). There was no significant difference between the two categories of household for the quantity of ME purchased (50.5 versus 49.5 kg/household), unlike for MPs (30.8 versus 28.8 kg/household) (p=0.007).

The 1,011 households that bought organic products in 2014 bought on average 0.9 kg of O-ME and 0.7 kg of O-MPs per year (Table 5). For households that bought organic meat alone (n = 454), the average amount purchased was 2 kg per year, but half of them bought only 0.7 kg (p50 = 0.70) and 75% only 1.8 kg (p75 = 1.78). The mean quantities bought by the 780 households purchasing only O-MPs were lower: the average was 0.9 kg/purchasing household and the median 0.27 kg/purchasing household.

Table 5 - Average quantities of meat and meat products purchased by organic and non-organic households in 2014.

	Non-org household	*Organic household*
Number	5,547	1,011
Average quantity purchased (organic and non-org)*(1) (2) (kg/year/household)	81.3	78.3
ME	50.5	49.5
*MPs***	30.8	28.8
Average organic quantity purchased (kg/year/household)	-	1.6
O-ME	-	0.9
O-MPs	-	0.7
Average number of all organic-product purchases(3)	17.2	110.5

*(1) Kruskal-Wallis test, ***: p<0.001; **: p<0.01; *: p<0.05.*
(2) Weighted data.
(3) All food products using the same database. Data from (Boizot et al., 2017).

So, as for purchases, the quantity of O-ME and O-MPs bought by purchasing households, on average, represented a small proportion of the total quantities of ME and MPs bought. This proportion came to 7.9% on average for ME (with p50 = 2.39 and p75 = 5.64) and 5.8% for MPs (with p50 = 1.2 and p75 = 3.7).

4.4. *Average prices*

The price differential between organic and non-organic products was positive for 10 of the 12 subgroups: in 2014, the values ranged from +34% (*beef*) to +134% (*ham*) (Table 2). The two subgroups for which the differential was negative (*Other meat and mixed* and *Other poultry processed products*) were highly composite aggregates for which the number of purchasing households was low and the organic quantities bought very limited. Any interpretation is therefore in-

tricate: it may be suggested that the products of these two subgroups; when bought by households as organic, are different from those purchased as non-organic. The absolute prices of the subgroups of organic and non-organic products and the orders of magnitude of the differentials were stable over the three years under study.

4.5. *Characterization of households buying organic meat products*

4.5.1. *Clustering of households according to their attitudes*

Four clusters were identified according to their responses to the four questions about attitudes (Figure 1):

- "Cluster 1" (n = 2,422, 38% of households) was characterized by low average scores for the four questions: they were not prepared to pay more for organic products and did not consider such products were of higher quality. Their sensitivity to environmental protection and care for their health was the lowest of the four segments;
- "Cluster 2" (n = 1,685, 26%) was made up of households that were highly sensitive to environmental and health issues but showed no particular interest in organic products;
- "Cluster 3" (n =1,122, 18%) had a similar profile to cluster 2 except that they considered organic products to be of higher quality (but without being prepared to pay more for them);
- lastly "Cluster 4" (n =1,142, 18%) included households whose scores for all four questions were high: they were concerned about protecting the environment and their health, they were convinced of the quality of organic products and ready to pay a surplus to buy them.

The proportion of OHs and NOHs was significantly different ($p<0.001$) depending on their membership of the various clusters (Table 6): one-third of households in cluster 4 were OHs versus 10.9% of those in cluster 1.

Figure 1 - Cluster centers of the k-means cluster analysis.

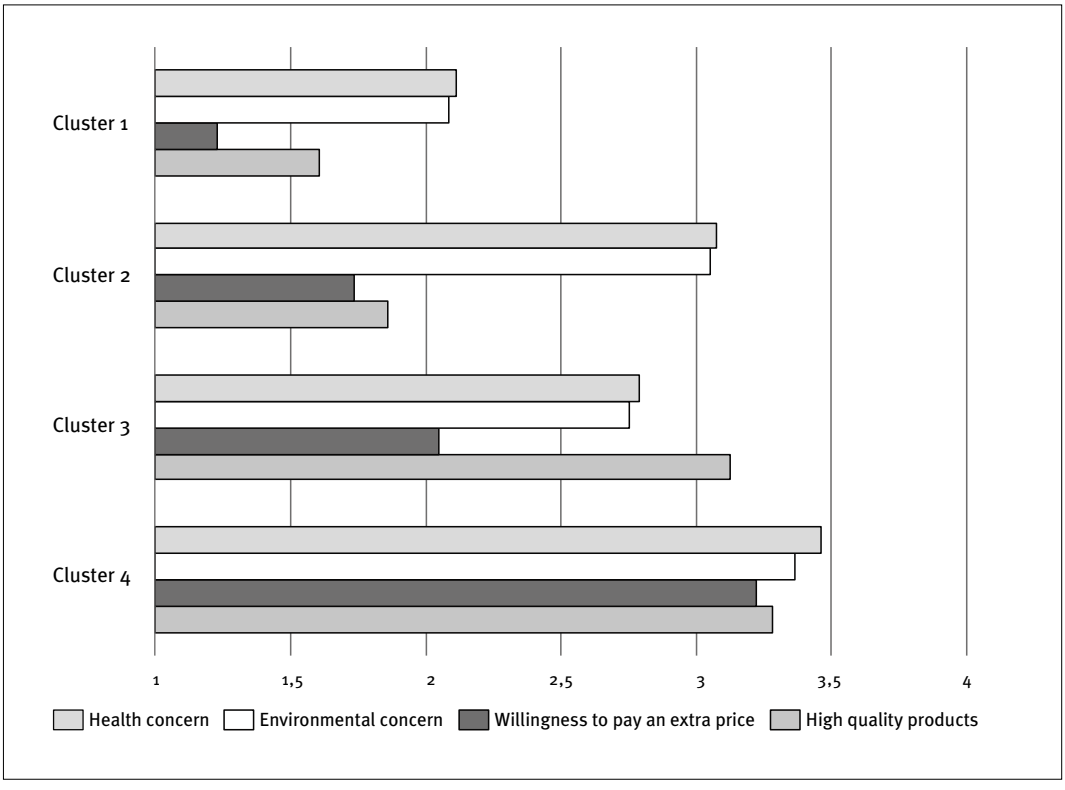

Table 6 - Socio-demographic characteristics of organic and non-organic households.

	Non-org household	*Organic household*	*Total*
Number	5,388	983	6,371
Number of people per household (average)	2.45	2.48	2.46
Number of consumption units(1) (average)	1.91	1.94	1.92
Socio-economic class***(2)			
Poor	12.60	10.48	12.28
Below average	42.06	36.01	41.12
Above average	30.18	33.57	30.70
Well-off	15.16	19.94	15.90
Life cycle***(3)			
Young/middle-aged singles	18.39	14.75	17.83
Elderly singles	13.57	12.61	13.42
Young/middle-aged couples	15.37	17.29	15.66
Elderly couples	12.64	14.05	12.86
Families with children in primary education	17.15	16.48	17.05
Families with children in secondary education	12.02	12.00	12.02
Families with grown-up children	10.86	12.82	11.16
Educational level***			
Less than high school diploma and no answer	45.04	38.25	44.00
High school diploma	23.42	22.69	23.31
2 years' higher education	17. 20	17.70	17.28
3 years' and more higher education	14.34	21.36	15.41
Age group			
< 35 years	9.61	8.75	9.48
35–49 years	33.85	31.94	33.56
50–59 years	18.86	19.33	18.93
60–69 years	18.56	19.53	18.71
70 years and +	19.12	20.45	19.32
Place of residence***			
Rural areas and urban units (UU) < 10 000 inhabitants	41.37	32.04	39.93
UU 10,000–100,0000 inhabitants	19.97	16.89	19.49
UU > 100,000 inhabitants	24.76	28.89	25.40
Paris and agglomeration	13.90	22.18	15.18
Clustering (attitudes)***			
Cluster 1	28.51	15.15	26.45
Cluster 2	40.05	26.86	38.02
Cluster 3	14.14	38.66	17.92
Cluster 4	17.30	19.33	17.61

*(1) Consumption unit (CU) corresponds here to a weighting of a person in the household depending on age and position in household. Household scores 0.3, adults aged 15 years and more 0.7, and children under 15 years score 0.5. (2) Pearson test, ***: p<0.001; **: p<0.01; *: p<0.05. (3) Young/middle-aged singles: 1 person in household (PH), 35–64 years, childless; Elderly singles: PH=1, >= 65 years, childless; Young/middle-aged couples: PH=2, 35–64 years, childless; Elderly couples: PH=2, >= 65 years, childless; Families with children in primary education: PH>=2, eldest child under 11 years; Families with children in secondary education: PH>=2, eldest child between 12 and 17 years; Families with grown-up children: PH>=2, eldest child between 18 and 24 years.*

Table 7 - Yearly mean number of purchases of organic meat products according to household attitudes in 2014.

	Strongly disagree	*Rather disagree*	*Agree*	*Strongly agree*
High quality of organic products	0.17[a]	0.34[a]	1.1[b]	4.86[c]
Willingness to pay premium for organic products	0.22[a]	0.47[a]	1.60[b]	7.08[c]
Environmental concern	0.26[ab]	0.44[a]	0.97[b]	1.64[c]
Health concerns	0.45[a]	0.43[a]	0.80[a]	1.83[c]

a b c: number of purchases with different letters differ significantly (p<0.05) (Tukey test).

The same applied to the average annual number of purchases of organic meat products (non tabulated data): households in cluster 1 and 2 made significantly fewer purchases per year than those in clusters 3 and 4 ($p<0.001$). Similar conclusions could be drawn by using the four attitude variables separately (Table 7): the higher the level of agreement with the affirmation (so the more positive the attitude), the higher the number of purchases.

4.5.2. *Logit model*

While the size and composition of the organic and non-organic households did not differ significantly, this was not so for most of the sociodemographic variables studied (Table 6). Organic households (OHs) were over-represented in the *well-off* socioeconomic class, in the most educated section (*3 years and more in higher education*), and in households living in an *urban unit of more than 100,000 inhabitants*. The same was true of couples and grown-up families. Conversely, singles aged less than 35 years were under-represented among OHs. These findings were confirmed by estimates from the logit model (Table 8): the relative probability of being a household that purchased organic products (OH) was about 1.3 times higher for households in the *well-off* class than for those in the *poor* class.

For equivalent sociodemographic characteristics (taken into account in the model), the residual deviation between the two classes was 3.3%. Belonging to a household with one or more children, being highly educated (*three years and more in higher education*), and living in a big city all increased the likelihood of purchasing organic products. Accordingly, the relative probability of being a household that bought organic products (OH) was about 1.9 times higher for households in *Paris and its agglomeration* than for those living in a *rural district or in an urban unit of fewer than 10,000 inhabitants*. Compared with the analysis of crude data (Table 6), the estimations of the model highlight the influence of there being a child in the household on the probability of the household being an OH. Thus, being part of a family with one or more children – regardless of category – raised the likelihood of being an organic purchaser. The fact that the values of the residual deviations were greater than the gross deviations for these categories reflected the specific role of this variable. Moreover, the relative probability of being an OH was about 4.2 times higher for households in *cluster 4* than for those in *cluster 1*, which was consistent with the conclusion from the analysis of the crude data.

Lastly, while the variables used in our model proved to be discriminant, they did not necessarily have the same "weight", that is, the same importance in becoming an organic household. Compared with the complete model, the highest variation in the AIC (therefore the greatest loss of information) was obtained by removing from the model the *place of residence* variable (+40 points), ahead of the *household life cycle stage* (+24 points), and the *clustering* (+ 22 points).

5. Discussion

Our findings are very far below the values from the various studies carried out in France

Table 8 - Summary of results of logit model for 2014 data.

	Parameter	*Odds(1) ratios*		*Marginal effect (%)(2)*	*Gross effect (%)(3)*
Socio-economic class *(ref=poor)*					
Below average	0.2092	1.233		2.29	2.57
Above average	0.2135	1.238		2.35	3.09
Well-off	0.2885	1.334	*	3.26	5.98
Life cycle (*ref= young/middle-aged singles*)					
Elderly singles	0.0845	1.088		0.75	2.09
Young/middle-aged couples	0.5179	1.678	**	5.47	4.91
Elderly couples	0.3439	1.410		3.39	4.67
Families – primary ed	0.5631	1.756	**	6.05	3.46
Families – secondary ed	0.5958	1.814	***	6.49	2.60
Grown-up families	0.8821	2.416	***	10.71	6.36
Educational level *(ref=less than high school diploma and no answer)*					
High school diploma	-0.0251	0.975		-0.27	0.79
2 years' higher ed	0.0106	1.101		0.12	2.03
3 and more years' higher ed	0.3151	1.370	**	3.90	8.31
Age group *(ref=Under 35 years)*					
35–49 years	0.0247	1.025		0.26	0.35
50–59 years	0.0807	1.084		0.87	0.94
60–69 years	0.2254	1.253		2.55	0.90
70 years and +	0.3146	1.370		3.68	1.37
Place of residence (*ref=Rural areas and UU < 10,000*)					
UU 10,000-100,0000	0.0931	1.098		0.93	0.61
UU > 100,000	0.3143	1.369	**	3.44	4.04
Paris and agglomeration	0.6627	1.940	***	8.26	9.38
Clustering (attitudes) *(ref : cluster 1)*					
Cluster 2	0.2488	0.780		-2.08	-2.19
Cluster 3	0.7744	1.691	***	5.97	6.42
Cluster 4	1.6840	4.200	***	22.26	23.09
_cons	- 3.3492				

(1) Relative probability of being a household purchasing organic products, conditional on factors allowed for in the model.
(2) Residual effect of the variable when other variables are maintained at their average value.
(3) Observed differences in levels of households purchasing organic products between each modality of a variable and its reference modality.
*Significance levels: ***: p<0.001; **: =p<0.01; *: p<0.05 / LR test: Akaike Information Criterion = 5257.32.*

on organic meat consumption (see section 2.). In 2014, the purchase of organic meat products recorded in the Kantar panel (that is, purchases of one such product at least once in the year) concerned only 7% of the households in the panel for meat and 12% for charcuterie. The number of O-ME and O-MPs purchases came to just 0.5% of ME purchases and 0.6% of MPs purchases. Moreover, the proportion of O-ME or O-MPs in the purchases of organic households (OHs) for ME and MPs is low in both numbers of purchases and quantities. It should be recalled that O-ME represent on average 9.1% of ME purchases and 7.9% of ME quantities in these households and that more than half of OHs purchased O-ME less than four times a year, that is, quantitatively, less than 3% of their intake of this product. The same observation can be made for O-MPs (7.1% of purchases and 5.8% of quantities). Two hypotheses can be proposed to explain these divergences between our indicators and those from earlier studies in France:

- an overestimation of the penetration and frequency of purchases by households in the works cited: for surveys, this can be explained by the fact that they are self-reported data based on questions that are not limited in time ("*Do you ever eat organic meat?*", "*How often do you eat organic meat?*") and not actual purchases. For works based on cohort monitoring, apart from the self-reported character of the information, it may be that the correction made for the sex variable does not fully offset the recruitment bias of participants in the study (long-term commitment, over-representation of highest educational levels, great awareness of nutritional issues and their impact on health, etc.) (Carrington *et al.*, 2010);

- and under-estimation in our evaluations. According to the Agence Bio (2016), poultry is the second-largest organic market in terms of value in the world of meat products. Moreover, the information published by extrapolation from the general population of the Kantar panel data indicates that in 2015, 8% of volumes of whole chickens and 3% of chicken pieces purchased by households were organic (Deman, 2016). Compared with these results, those obtained in our study are lower than expected for the three years covered for poultry meat, both in terms of penetration and numbers of purchases and quantities. It can be assumed that some purchases of chicken in the base used in this paper were not properly identified as organic and were counted as non-organic instead for this product category. It should be observed, though, that the values obtained are not very different from those observed by Marian *et al.* (2014) in Denmark with GfK panel data for the proportion of purchasing households (17% of purchasing households for red meat and 2% for poultry) and for the annual number of purchases per purchasing household (3.4 and 2.7 respectively).

Moreover, our study does not reveal any major differences in purchasing behavior between OHs and NOHs. While the number of ME or MPs purchases is significantly higher for OHs, the average quantities purchased per purchasing household are similar to those of NOHs. This can be explained by the level selected for characterizing a household as organic (at least one organic purchase in one or other of the groups of products in the year) and the low proportion of organic purchases in total purchases, that are not very discriminating. A more "demanding" definition was not adopted because of the small number of purchasing households and the frequency of purchase, which would have led to two very unequal sub-populations. This difficulty raises the question of the relevant level for characterizing a household as "organic". Earlier works on the whole range of products (Pino *et al.*, 2012) or just on meat products (Krystallis *et al.*, 2006; Anders and Moeser, 2008; Van Loo *et al.*, 2010) have highlighted differences in attitudes and purchasing behaviors with regard to organic products depending on whether purchases were frequent or occasional. However, the key to household distribution is often based either on a self-reported variable – the categories of which are imprecise (seldom, sometimes, often, etc.) and probably understood differently by different respondents – or on fixing somewhat arbitrary numerical values as the limits (Anders and Moeser, 2008; Pino *et al.*, 2012).

One of the differences highlighted between regular and occasional consumers of organ-

ic products is sensitivity to price. Rödiger and Hamm (2015) observe that, compared with their market share, the question of price differentials between organic and non-organic meat products is over-represented in studies on this theme. Several of them report that it is one of the primary curbs on purchasing these products (Hughner *et al.*, 2007, Aertsens *et al.*, 2009; Van Loo *et al.*, 2012) and that willingness to pay is quite low (Krystallis *et al.*, 2006; Van Loo *et al.*, 2011) and dependent on the frequency of consumption (Ureña *et al.*, 2008). The levels of price difference observed in our study (+34 to +134% depending on the group of products) are liable to reduce the frequency of purchase (and/or the unit quantities bought) or to dissuade new purchasers. Marian *et al.* (2014) have shown, for panel data in Denmark, that high prices were detrimental to repeat purchases of organic products by purchasing households. Another obstacle traditionally reported in the literature is access to the products (Verhoef, 2005; Van Loo *et al.*, 2012). Even if they have come to be widely distributed outside the specialized channels in France (as evidenced by the predominant share of panel purchases in hyper- and supermarkets), the presence of some products in shops is limited, especially in areas of low population density. The over-representation of OHs in cities of more than 100,000 inhabitants highlighted by our analysis, and the substantial weight of the *place of residence* variable in the logit model seem to confirm the importance of increased numerical distribution as a development factor. Improving the distribution of these products would limit the cost of access to them – that is, the balance between the purchaser's motivation and the effort required – for most people (Kriwy and Mecking, 2012). This finding is consistent with the conclusions of earlier studies indicating that the order in which organic products are adopted is inversely related to the behavioral costs (reflected in popularity and availability) (Buder *et al.*, 2014; Juhl *et al.*, 2017).

Although O-ME and O-MPs are not the most popular nor readily available in all circumstances, a connection can be observed between the opinions expressed (attitudes) with respect to the four factors (quality, WTP, environment and health concerns) and household purchasing behavior for meat products. In other words, it can be concluded that the attitude-behavior gap is narrow for the sample under study. It may be hypothesized that, to the extent that O-ME and O-MPs are not very popular among buyers of organic products, those who do buy them are convinced of their quality and their worth and their attitudes are reflected by their purchasing acts.

Lastly, our results show that OHs do not buy O-ME and O-MPs exclusively and that NOHs buy organic products other than O-ME or O-MPs. As attested by earlier studies (Buder *et al.*, 2014; Boizot-Szantai *et al.*, 2017), this suggests that O-ME and O-MPs are not the first food group adopted in the context of a dietary change toward more organic products.

6. Conclusion

Our study uses panel data to characterize the purchasing behavior of households that buy organic meat products, their sociodemographic characteristics, and their attitudes. This approach does have the advantage of being based on actual purchases by a representative sample of the population and not on self-reporting by survey respondents. The results tend to show that the use of self-reporting leads to an overestimation of the true weight of organic meat products in households' home consumption.

There are limits to our study: as stated above, the choice to work on a group of products that is admittedly broad but that was little consumed by households over the study period, introduces a substantial imbalance between the number of OHs and NOHs. This means a higher limit cannot be set in terms of the number of purchases of organic meat to define an OH household, at the risk of there being too few such households. It is reasonable to think that this is prejudicial to the identification of more marked effects of sociodemographic variables on the probability of purchasing or not purchasing organic meat products. A second limitation relates to the period of study (2012-2014) which was chosen because it corresponded to the latest available panel data:

since then, the consumption of organic products, of all types, has surged in France as in other countries of Europe and the use of more recent data might have made it possible to remove in part the limitation referred to above. Lastly, certain sociodemographic variables that influence the probability of being an OH household (place of residence, educational level, and socio-economic class) are dependent on the intrinsic characteristics of our sample, which might call into question the validity of the effects highlighted. However, this dependence is only partial insofar as it concerns only one category of the variables. The fact is that the step-by-step addition of the three variables improves the quality of the logit model. In addition, consideration of interaction among the variables does not provide a model that fits significantly better.

Our findings suggest a number of strategic recommendations for developing the organic meat market. The first is to reduce the effort required of potential purchasers to buy the products by making them more readily accessible (development of points of sale, more extensive distribution channels). The second is to highlight credence attributes when promoting organic meat. Unlike with the price difference between conventional and organic products, consumers cannot easily evaluate the gap between these categories for attributes such as health safety, environmental protection – and sustainability more generally (Ben Abdallah *et al.*, 2018). However, these attributes are crucial to their motivations for purchasing organic products (Lee and Hwang, 2016). Growing consumer interest for animal welfare and nutritional information provide opportunities for extending the market by raising the proportion of organic meat eaten by households that are already purchasers of it and by winning over new customers (Akaichi *et al.*, 2019). A third and final recommendation is to adopt "made to measure" communication strategies targeting consumer types with different motivations for purchasing organic products depending on their level of purchases (small buyer/big buyer) (Lee and Hwang, 2016) or their values (self-transcendence, openness to change, self-enhancement, conservation) (Hansen *et al.*, 2018).

To extend this work, it might be relevant to supplement the characterization of the two types of households (OHs and NOHs) by integrating the intensity of their spending on organic products – as defined by Boizot- Szantai *et al.* (2017) – *i.e.* the proportion of their total spending (on products of all types) that goes to organic products and by studying possible substitutions among groups of products in the overall diet. Boizot- Szantai *et al.* (2017) have shown that big consumers of organic products eat more fruit and vegetables and less meat than consumers of conventional products or lower-level consumers of organic products. This perspective would provide further insight into the purchasing behavior of French households with respect to meat and meat products.

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