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RESEARCH ARTICLE

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Observational learning in food choices: The effect of product familiarity and closeness of peers

Anna K. Edenbrandt[1] | Christian Gamborg[2] | Bo Jellesmark Thorsen[2,3]

[1]Department of Economics, Swedish University of Agricultural Sciences, Uppsala, Sweden

[2]Department of Food and Resource Economics, University of Copenhagen, Copenhagen, Denmark

[3]Centre for Macroecology, Evolution, and Climate, Globe Institute, University of Copenhagen, Copenhagen, Denmark

Correspondence
Anna K. Edenbrandt, Department of Economics, Swedish University of Agricultural Sciences, 750 07 Uppsala, Sweden.
Email: anna.edenbrandt@slu.se

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Abstract

The behavior among peers may be interpreted as useful information in individuals' decision processes, although such observational learning is typically not accommodated in consume choice models. This study incorporates information about other consumers' behavior in a choice experiment to evaluate if it affects choice probabilities. Market share is used as a proxy to signal that a product is chosen by many of the individual's peers. Although the effect is associated with diversity, there is a segment of individuals that perceive high market shares to carry relevant information for their food purchasing decision. Respondents who expect to hold similar or more positive preferences towards an unfamiliar food attribute relative to their peers are positively affected by a high market share. Taking information signals from peers' behavior into account may improve understanding of consumer behavior and improve our ability to predict the reception of new food aspects. [EconLit Citations: Q18; D12; D83].

1 | INTRODUCTION

Consumers face a diversity of food items and an extensive amount of information about the food's characteristics, for example, about nutritional value, production methods, and place of origin. In principle, if the information presented on a product is accurate and perceived relevant and adequate, it enables the consumer to make choices that are more informed and to purchase products that better satisfy their individual preferences and values. However, on average, consumers are faced with more than 200 food decisions per day (Wansink & Sobal, 2007), implying that making fully informed choices on every occasion is demanding. Many consumers do not pay attention to much of the information available or are unable to handle the information (Verbeke, 2005). Information presented on products, such as food labels is, however, but one among many channels for consumers to obtain information about products. Other examples include advertising, manufacturer name, and packaging (Caswell, 2006). In addition, information about the choices made by other consumers can be a conscious or unconscious part of an individual's decision process. This is referred to as observational learning and is the focus of this study.

In economic theory and models, consumers are assumed to process information accurately to evaluate with precision the attributes of the products available and choose the product that yields the greatest utility among any number of alternatives. The influence of peers is, however, generally ignored in economic analysis, and it is relevant to ask if the inclusion of such influences can help us explain the way people make their consumption choices (Manski, 2000; McFadden, 2010). Peer influence in the context of food choices has been explored in experimental settings within sociology, psychology, and behavioral science (Larson & Story, 2009). Social influence from the companions in a group affects the healthiness of the food chosen and the amount of food consumed (Cruwys, Bevelander, & Hermans, 2015; Higgs, 2015; Robinson, Thomas, Aveyard, & Higgs, 2014). This study rather focuses on informational influences, so-called observational learning, which describes how an individual gains knowledge about a product itself from noticing peers' behavior. We furthermore focus on food purchases, rather than eating in a social setting, and in the purchase setting, companion influence is less likely. We hypothesize that observational learning is particularly relevant in the presence of new or unfamiliar food products, with which the individual has little prior experience or knowledge. Theoretical models incorporating the mechanisms behind observational learning were introduced in Banerjee (1992) and Bikhchandani, Hirshleifer, and Welch (1992), and empirical applications of observational learning from peers are widely available in the fields of finance (Bikhchandani & Sharma, 2000) and travel demand (Abou-Zeid, Schmöcker, Belgiawan, & Fujii, 2013; Chorus, 2012). Existing studies are often based on revealed preference data, where it is difficult to isolate the effect of observational learning from other reasons to conforming behavior. Similar behavior among individuals in a group can be attributed to individuals interpreting their peers' behavior as valuable information (i.e., observational learning) but it can also be explained by other mechanisms, which are confounded in revealed preference data, implying difficulties in causal interpretation (Manski, 1993), although important econometric developments have been presented to target prevalent endogeneity problems in discrete choice models on market data (Brock & Durlauf, 2001; Walker, Ehlers, Banerjee, & Dugundju, 2011). Furthermore, revealed preference studies do not allow us to study the potential role of peer behavior on the individual's assessment of product attributes with which they have no prior experience.

The aim of this study is to explore the role of observational learning in food choices, in particular with respect to the reception of new or unfamiliar food products. We apply stated preference methods allowing us to set up an experimentally constructed market. A choice experiment was conducted where information about the market share of the products was included as a proxy for peer behavior, to study if this affects respondents' choice probabilities. First, we test if the market share is incorporated into the choices. Next, we hypothesize that taking others' behavior into account is more relevant when considering complex or unfamiliar aspects. We, therefore, test if the effect of market share is different depending on the level of familiarity with the attribute, using genetically modified (GM) technologies to represent less familiar food attributes. The case of GM technologies in food is not only unfamiliar for consumers in purchase situations in many countries, but it is also a topic that has been controversial since the first food product was approved for release in 1994 in the US. Since then much effort has been undertaken to

understand the negative reception (Frewer, 2017). In this study, the case of GM provides an opportunity to obtaining insights on this matter; that is, is the willingness to purchase GM products affected by other individuals' purchase behavior as reflected in market share? The term GM is very broad, and developments in the field have resulted in new breeding technologies, including gene editing that may provide environmental and/or more direct consumer benefits (Palmgren et al., 2015). Knowledge about factors that affect consumer reception of these new technologies are therefore of interest, and the potential impact of peer behavior, that we explore in this study, is one such factor. We also expect that these insights can be useful in the case of other emerging technologies. Finally, we hypothesize that closeness to peers implies stronger influence of peers' behavior on individuals' choices, for which reason we test if the respondents are more affected by the market share of a product when it is reported for a group of peers they are likely to perceive as more similar to themselves than when reported for a broader group of peers.

2 | THEORY

Standard economic theory of consumer behavior assumes that individuals are rational actors with predetermined, stable, and individualistic preferences that use available information to make consistent and predictable decisions that maximize utility. Often individuals appear to make choices similar to their peers, and this can be explained by similar independent preferences, or by individuals being influenced by their peers in their decision-making. Incorporating other individuals' behavior in decision-making can be accommodated in the standard theory of consumer behavior when the reason is that it affects utility (McFadden, 2010). One example where individual preferences are affected by the choices of others is the presence of network externalities, where the utility of an individual may increase when many individuals consume the same good. Another impact pathway is related to norms. There is experimental evidence that individuals' contributions to public goods or charitable donations are affected by the contributions among peers (Alpizar, Carlsson, & Johansson-Stenman, 2008; Frey & Meier, 2004). Peer influence in such studies is characterized by "altruistic" choices, and by social expectations—pointing to the force of social norms and/or desires to conform. Choosing food in a social setting is also affected by norms; individuals appear to select healthier food choices when peers have selected such food and to adjust the amount eaten in accordance with their companions (Higgs, 2015). The choices made by other consumers may also affect the individual by imposing constraints on the choices available (Manski, 2000; McFadden, 2010); products will not be supplied by producers if other consumers do not demand them.

There is, however, also evidence that individuals are affected by their peers' behavior even in cases where neither direct utility effects nor constraints are seemingly at play. If the choices of others are interpreted as an information signal it may give rise to observational learning. It may be cheaper, for example, require less effort, to interpret peers' behavior as signals than to search for information from other sources or obtain it from their own experience. A common example is the choice of restaurant; if a diner is crowded, this may be interpreted as information about the quality, resulting in already popular restaurants becoming even more populated. This kind of behavior is characterized by no direct increase in utility from following others; it is rather based on the belief that other people's behavior is based on information that the decision-maker does not have but which is considered correct and relevant for making a choice, and which can otherwise only be acquired at a cost.

The first formal economic models of conforming to peers were presented in Banerjee (1992) and Bikhchandani et al. (1992) and further developed with different underlying assumptions in following work (Young et al., 2009).[1] The theories have been tested in experiments (Anderson & Holt, 1997; Celen & Kariv, 2004) and empirically in

[1]Peer effects have been studied within psychology and sociology, including early influential work by (Asch, 1955) who studied conformity in individual's judgment in an experiment and (Deutsch & Gerard, 1955), who explore conformity and informational social influences. Cialdini and Goldstein (2004) provide a review of social influence and conformity in the psychology literature.

different areas, ranging from traffic mode choice (He, Wang, Chen, & Conzelmann, 2014) fertility decisions (Montgomery & Casterline, 1996), voting (Schmitt-Beck, 1996), finance (Bikhchandani & Sharma, 2000), technology adoption (Maertens, 2017), marketing (Chen, 2011), and even the kidney donation market (Zhang, 2010). Interpreting peer behavior as information is referred to in different terms in the literature, but we will refer to it as observational learning throughout the paper, and the impact from others will be referred to as peer effects.

McFadden (2010) concludes that observational learning is more likely when little is at stake and when the cost of finding and processing information is perceived as high. As consumers make numerous food decisions every day (Wansink & Sobal, 2007), and each food item constitute a small share of most consumers' income, this suggests that in each decision relatively little is at stake compared with other singular decisions, such as purchasing a home or choosing education, which most individuals do few times in their lifetime.[2] In sum, given that relatively little is at stake, and that the cost in terms of time and effort of processing information is likely to be high, food purchases is an area where observational learning seems probable. Information about peers' preferences and choices is communicated in various channels, such as media, opinion letters, conversations with others, and social media. In the context of food, shelf space may signal popularity (market share) of products. As an example, soy milk has a small part of the total milk sales in Denmark; organic milk is more common, but still constitutes a limited part of the total sales of milk, while conventional milk is the most sold type of milk (GfK ConsumerScan Denmark). Based on this reasoning we want to test:

H1. *Information about the market share of a product affects individuals' food decisions.*

While we can test for behavioral impact of information about the market share of a product (H_1), we can only speculate on the kind of observational learning that individuals retrieve from this. In other domains of observational learning, individuals may learn from peer behavior about the profitability of investments (finance), or about the quality and safety of a product or service (technological adoption, marketing). In the case of food decisions, we expect that quality and safety are among the learnings that an individual may deduce from a high market share.

Benefits from incorporating peer behavior into the decision process arise in situations where the individual does not perceive herself to have complete information (Bikhchandani, Hirshleifer, & Welch, 1998) and the costs for finding and using information is high (Shiller, 1995). This suggests that peer behavior is more likely used as information in unfamiliar choice tasks (McFadden, 2010). Empirical evidence from a randomized natural field experiment in a restaurant setting supports this; customers that visited the restaurant infrequently were more prone to observational learning from peer behavior (Cai, Chen, & Fang, 2009). While food items are purchased on a frequent basis and highly familiar to the consumer, the introduction of new technologies and production methods implies an initial low level of knowledge and familiarity among consumers. Accessing information and obtaining knowledge about such new technologies/methods is costly for consumers. Consumers may, for example, be familiar with the organic label, while GM food is less familiar, particularly in countries where it has a low presence in the market. We, therefore, test the following hypothesis:

H2. *The impact on individuals' choices from learning about the market share of a product with a specific attribute depends on their familiarity with the food attributes.*

It should be noted that choice situations of unfamiliar attributes—where little is at stake, and the cost of retrieving or processing information is high—do not only open for possibilities of observational learning. Individuals may also use different forms of heuristics that ease the information process in their choice tasks (Kahneman, 2003).

[2]If consumers are in doubt about the food safety and perceive the risk from consuming certain food items as high, they may experience that much is at stake for each individual food decision. This is, however, not expected in most developed countries with well-functioning food safety regulatory systems.

Finally, observational learning increases when the peers are individuals characterized by homogenous preferences (McFadden, 2010). Peers can range from those closest to the individual, such as family and friends, to the neighborhood, and in the widest form to peers in the same social class or with the same nationality (Ben-Akiva et al., 2012). The more distant, the more faceless are the peers; the closer the more of an in-group the individual may see them (Kahneman, 2003). If people perceive themselves as very different from others, they will listen less to others and rely on their own knowledge, making observational learning less likely (Manski, 2000). This study investigates if peer effects are more important in individual decision-making when it refers to peers that are closer to them. The following hypothesis is therefore tested:

H3. *The impact on individuals' choices from learning about the market share of a product depends on the closeness to the peers that form the market referred to.*

Previous studies have found large heterogeneity among individuals in the reactions to peers' behavior (Bursztyn, Ederer, Ferman, & Yuchtman, 2014; Cai et al., 2009; Salazar, Oerlemans, & Van Stroe-Biezen, 2013). Thus, we will investigate observational learning on average as well as the distribution of such effects among individuals.

3 | METHODS

3.1 | Measure of other consumers' behavior

Using revealed preference data from purchase situations would be desirable for studying consumer behavior, as there are important limitations with stated preference data (such as hypothetical bias). The use of data from a market setting was, however, not suitable for the research questions raised in this study. Analyzing the potential impact of market share based on revealed preference data implies certain difficulties as this may be correlated with other attributes, which means we are not able to disentangle peer effects from similar preferences. Moreover, peer effects can be attributed to different mechanisms, where observational learning is but one mechanism through which peers can affect individuals' behavior (Bursztyn et al., 2014; Cai et al., 2009). Market data does not allow us to isolate observational learning from, for example, salience or social influence. Another limiting factor with market data is that it is restricted to well-known attributes present in the data. In sum, the limitations of market data in exploring observational learning in food choices suggest using experimental data instead. Using a choice experiment enables us to target the above-mentioned weakness with market data by allowing the market share to vary freely among the other attributes, and to investigate the role of peer effects in the presence of unknown attributes. Moreover, as participants in the experiment are isolated from social feedback, the peer effects measured are more likely attributed to observational learning than other social influence mechanisms such as norms.

3.2 | Data

The survey instrument was tested in a focus group ($n = 6$), and this resulted in modification of the questions to improve clarity and precision as well as adjustments to the attributes and levels included in the choice experiment. Next, a small pilot study was distributed ($n = 41$) leading to further refinements of the survey. The final survey included questions related to beliefs and preferences regarding attributes included in the choice experiment. Next, respondents were provided the choice tasks and subsequently asked to rate the importance of each of the attributes and questioned about their general interpretation of market share in the food market. These questions were provided after the choice tasks to avoid biasing their choices.

The choice experiment included eight choice tasks where the respondents were presented with three different milk alternatives and the option not to purchase any milk. Milk was used as it is a homogenous product with few attributes and a product that many consumers purchase regularly, increasing the reliability of the results from this study, and the basis for applying the results to similar food choice situations. Each of the three alternatives was described in terms of their market share, which could vary (5%, 15%, and 80%), but constrained to add up to 100% in each choice situation. The division of market shares was selected as one should constitute a sizable share to signal popularity, while the other two should be small and due to the experimental design, they should not be equal. A second attribute was included which allowed us to test if the potential impact of market share was affected by the familiarity with the attributes. Consequently, the milk alternatives were described in terms of production and breeding method, including the organic method, which is considered well-known among consumers, and GM technology as an example of a less familiar technology where labeled products were not present in the market at the time of data collection. The setup included four different levels; milk from (a) GM cows fed with GM fodder, (b) traditionally bred cows fed with GM fodder, (c) traditionally bred cows fed with traditionally bred fodder, and (d) traditionally bred cows fed with organic fodder (organic milk). The technological variation of each of these types was described briefly before the choice tasks and illustrated with symbols in the choice tasks (see the Supplementary Material A). The milk alternatives were also specified in terms of price and fat content. Whole milk was not included, as information from the focus group revealed that such milk is mainly used in cooking and is, hence, not a substitute to the other milk types. Table 1 presents a summary of the attributes and levels. Presenting every possible combination of the attribute levels would yield a large number of alternatives, and would thus be burdensome for the respondents. Instead, the alternatives that the respondents faced resulted from a fractional factorial design using the D-efficiency criterion to select the final design. Hence, the breeding and production aspects that described the milk products did vary in order between the choice tasks, as well as how they were combined with the price levels and the attribute organic/conventional. The parameters from the pilot study were used as priors when generating the choice tasks, using the software NGENE (ChoiceMetrics, 2012).

The survey was designed to test if the degree of observational learning from peer behavior is affected by the closeness of those peers to the individual. The challenge with defining suitable segments of influence is stressed in other studies (see discussions in Ben-Akiva et al., 2012 and Walker et al., 2011). We, therefore, included two alternative measures of closeness. First, the sample was split in two, where half of the participants were presented with the market share of each alternative referring to the entire population in Denmark (distant and faceless

TABLE 1 Product attributes and levels

Attribute	Levels
Breeding and production method	GM cow fed with GM fodder Traditionally bred cow fed with GM fodder Traditionally bred cow fed traditionally bred fodder Traditionally bred cow fed organic fodder (organic milk)
Fat content	Skim (0.1%) Low-fat (0.5%) Reduced-fat (1.5%)
Market share	Represents 5% of all milk sold in Denmark/local store Represents 15% of all milk sold in Denmark/local store Represents 80% of all milk sold in Denmark/local store
Price[a]	4, 5, 7, 9, 11, 13[b]

Abbreviation: GM, genetically modified.
[a]Price in DKK. 1€~7.5 DKK.
[b]Price levels were selected to reflect the market prices in Denmark during the point of data collection.

peers), while the other half of the sample were presented with the market share referring to customers in their local store (closer and less faceless peers). This was to approximate information about people similar to the respondent, assuming that people tend to live and shop in neighborhoods with people that are more similar to themselves than the average person in the country. Similar assumptions are made in Walker et al. (2011). Second, we define segments based on self-rated similarity in preferences with peers. Before the choice sets, respondents indicated their personal attitude towards GM as well as their expectations regarding the attitudes towards GM among their friends and Danes.

The survey was distributed in December 2014 to a consumer panel managed by GfK ConsumerScan Denmark and resulted in 901 completed surveys, and after excluding observations with non-responses to the specific questions included in the analysis, 873 survey responses remained (response rate 57%). Participation in the survey was voluntary, and the consumer research firm aims for a panel of households as representative of the Danish population with respect to basic demographic characteristics, as possible. The sample of responses to our survey turned out to have a slight overrepresentation among older respondents and those in the medium-income segment. Females are heavily overrepresented among respondents (73%), which is typically the case in responses from consumer panels, as females tend to be responsible for food purchases. A full presentation of the demographic composition of the sample is presented in Supplementary Material A.

3.3 | Econometric framework

Analyses of choice experiment data are commonly based on the Random Utility framework (McFadden, 1974), where the utility derived from a product is the sum of the utility derived from each of its characteristics (Lancaster, 1966). The individual is assumed to select the alternative among a set of products that yields the greatest expected utility (McFadden, 1974). For individual i the utility from the selected milk variant n, on choice occasion t can be written as:

$$U_{int} = \beta_{1i} optout_{int} + \beta_{2i} GMGM_{int} + \beta_{3i} ConvGM_{int} + \beta_{4i} Org_{int} + \beta_{5i} Redfat_{int} + \beta_{6i} Lowfat_{int} + \beta_{7i} MS15\%_{int} + \beta_{8i} MS80\%_{int} + \beta_{9i} price_{int} + \varepsilon_{int}, \quad (1)$$

where β are parameters to be estimated for the price and product attributes. The traditionally bred cow fed with traditionally bred fodder is the base level, while parameters are estimated for milk from GM cow fed with GM fodder (*GM_GM*), traditionally bred cow fed with GM fodder (*Conv_GM*) and organic milk (*Org*). The skimmed milk is the base level, while parameters for reduced-fat (*Red_fat*) and low-fat (*Low_fat*) are to be estimated, and for the market share, 5% is the base level. The *opt-out* parameter refers to the alternative of not purchasing any milk. The error terms, ε, are assumed to be IID and have a Type I extreme value distribution with constant variance. The choice probability for the selected product takes the form of the multinomial logit (MNL) model, while specifying parameters with distributions relaxes assumptions of IIA and enables a panel specification, resulting in a random parameter logit (RPL) model (Train, 2003). The choice probability for the sequence of choices made by individual i can be written as:

$$P_{in} = \int \prod_{t=1}^{T_i} \frac{exp\left(-\alpha price_{int} + \sum_{k=1}^{K} \beta_{ki} X_{int}\right)}{\sum_{j=1}^{J} exp\left(-\alpha price_{ijt} + \sum_{k=1}^{K} \beta_{ki} X_{ijt}\right)} f(\beta_i \mid \theta) d(\beta_i). \quad (2)$$

This implies stable preferences for individuals throughout the choice tasks while preferences differ between individuals (Train, 2003). Each of the product attribute parameters are specified with normal distributions: $\beta_i \sim b + \sigma e_i$ where b is the parameter mean, σ represents the standard deviation, and a random error term $e_i \sim$ i.i.d. N(0,1). The cost parameter is assumed negative for all respondents and to have a lognormal distribution. The RPL-model does not have a

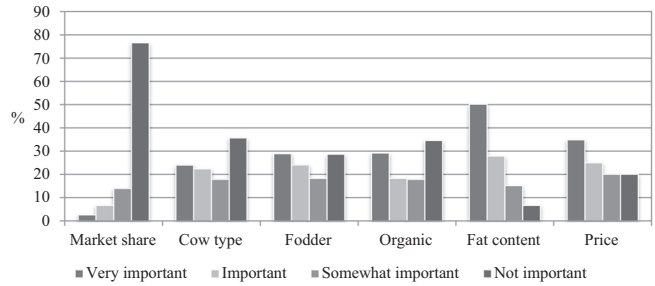

FIGURE 1 Stated importance of choice task attributes

closed-form solution, wherefore simulations are required for estimation. We use 5000 Halton draws, and estimations are performed in the software Nlogit.

4 | RESULTS

The importance assigned to each of the attributes by the respondents in the choice experiment is presented in Figure 1. Fat content, which is related to health, taste and perhaps drinking experience, is highly familiar to respondents and is also by far rated as the most important attribute. The importance attached to organic is rather polarized; almost a third of the respondents rate it as very important, while more than third rates it as unimportant. Breeding type for cow and fodder was not labeled in the market at the time of data collection and it was, hence, not a familiar attribute to respondents. Similarly to organic, the attached importance to breeding type is polarized, although to a smaller degree. While market share is clearly the least important attribute in the choice tasks, a considerable share (23.4%) state that it has some or more importance. We note that the respondents who indicated that market share has some or more importance are not statistically significantly different compared with those who indicate that market share has no importance with respect to gender, age, or residential region, but they do have a lower level of education. We also note the tendency to bi-modal distributions for all the technology attributes.

Following the choice tasks, the respondents indicated how they, in general terms, interpreted two different scenarios. The results are presented in the first column in Table 2. When most others (Danes or individuals in a

TABLE 2 Stated interpretation of peers' willingness to purchase

	All	Danes	Local area	Difference[a]
If most other Danes/people in my local area are willing to buy genetically modified milk....				
... I assume it is safe to drink	23.8	26.1	21.3	15.0***
... I assume it is a responsible breeding technique	15.7	19.1	11.9	
... it does not affect my choice	60.5	54.8	66.8	
	100%	100%	100%	
If most other Danes/people in my local area are willing to buy organic milk....				
... I assume it is healthy to drink	12.9	14.2	11.4	7.09**
... I assume it is a responsible prod. method	26.7	29.5	23.5	
... it does not affect my choice	60.5	56.4	65.1	
	100%	100%	100%	

Note: Asterisks (*,**,***) indicate statistical significance at the 10%, 5%, and 1% levels, respectively.
[a]Genetically modified is a dummy taking the Value 1 if cow and/or feed is GM.

local store, depending on treatment) purchase GM milk 39.5% of the respondents believe it provides a signal about the technology. The share that attaches importance to the behavior of others is similar to the organic attribute. A cross-tabulation (not presented) reveals that these are mainly the same respondents; 53% state that other peoples' purchase behavior of organic or GM carries some information in one or both cases. These initial findings suggest that peer behavior does affect a nontrivial proportion of respondents, although the familiarity of the attributes (organic or GM) does not seem to matter.

4.1 | Large market shares affect choices

Estimation results of an RPL-model are presented in Table 3 (Model 1).[3] As expected, the price parameter is significant; respondents are more likely to choose a product that is cheaper, all else equal. The organic attribute is valued positively, in accordance with previous research (Hughner, McDonagh, Prothero, Shultz, & Stanton, 2007). The standard deviation is, however, large relative to the mean, suggesting significant variation in preferences towards the organic production method. Moreover, in line with previously stated preference studies, consumers have negative preferences for GM food relative to conventional (Dannenberg, 2009). Compared with organic, respondents are more homogenous in their negative preferences regarding GM cows (*GM_GM*). For the fat content, we had no prior expectations, as it is more a matter of personal preferences such as taste or perceived healthiness, and this is confirmed in the large variation in preferences towards the different fat contents. The alternative of not purchasing any milk (*opt-out*) is negative, indicating that respondents prefer the baseline milk type over no milk.

To investigate if market share affects choice probabilities, we test if the market share attribute is different from zero. Market share is specified as nonlinear in the model, that is, 5% market share is the base level and we test if $\beta_{15\%} = 0$ and $\beta_{80\%} = 0$. The high market share coefficient (*80%*) is statistically significantly different from zero at a 10% level; a large market share increases the likelihood that the respondents choose that alternative, all else equal. However, the relative size of the coefficient mean is small compared with the other attributes, and the large standard deviation relative to the mean suggests heterogeneity among individuals in the effect from the market share.[4] The lower market share (*15%*) is insignificant, revealing that respondents at large do not differentiate between *5%* (base level in the models) and *15%* market share. These results are expected, as we a priori hypothesized that a large market share sends a signal, while lower shares and small differences in market share do not necessarily provide information to consumers.

4.2 | Familiarity affects impact of market share

The second hypothesis concerns if the information on peer choices plays a bigger role when the consumer is considering unfamiliar aspects of food products. Labels related to breeding types are not common in the market place and, hence, consumers are not accustomed to incorporating such information in their purchase decisions. In contrast, the other product attributes are all assumed to be highly familiar to the respondents, as they are present in the market and all constitute nontrivial market shares. For non-flavored drinking milk, the organic market share was 28% in 2014, and the market shares for skimmed, reduced-fat, and low-fat covered 24%, 41%, and 23%,

[3]The RPL specification improves model fit significantly compared with the MNL-model (Likelihood Ratio statistic = 5,236.64). In addition to Model 1, alternative distributions were tested (triangular and constrained triangular distributions), but this resulted in worse model fit, wherefore we proceed with the specification in Model 1.

[4]We conducted robustness checks and estimated alternative model specifications to explore this heterogeneity. Results from model specifications with discrete distributions in the market share attributes support the conclusions in Model 1 of heterogeneity in preferences among individuals. It further reveals that a large share of individuals is positively affected by market share, while a smaller share is negatively affected.

TABLE 3 Estimation results RPL-models

	Model 1		Model 2		Model 3	
	Coefficient (se)	Standard deviation (se)	Coefficient (se)	Standard deviation (se)	Coefficient (se)	Standard deviation (se)
Price	−0.87***	1.14***	−0.86***	1.13***	−0.83***	1.09***
	(0.05)	(0.04)	(0.05)	(0.04)	(0.05)	(0.04)
Opt-out	−6.22***	6.30***	−6.18***	6.25***	−5.88***	6.00***
	(0.32)	(0.34)	(0.32)	(0.34)	(0.29)	(0.31)
Breeding						
GM_GM	−5.09***	4.00***	−5.09***	4.01***	−5.04***	3.99***
	(0.31)	(0.28)	(0.32)	(0.28)	(0.31)	(0.28)
Conv_GM	−2.99***	3.48***	−2.97***	3.48***	−2.93***	3.44***
	(0.20)	(0.23)	(0.22)	(0.23)	(0.22)	(0.23)
Organic	1.06***	3.67***	1.00***	3.68***	1.00***	3.65***
	(0.18)	(0.21)	(0.19)	(0.21)	(0.19)	(0.21)
Fat content						
Red_fat	0.51**	5.63***	0.49***	5.61***	0.47**	5.60***
	(0.20)	(0.29)	(0.20)	(0.28)	(0.20)	(0.28)
Low_fat	1.34***	4.12***	1.36***	4.11***	1.34***	4.14***
	(0.16)	(0.22)	(0.16)	(0.22)	(0.16)	(0.22)
Market share						
15%	0.08	0.42*	0.08	0.15*	0.09	0.38
	(0.10)	(0.25)	(0.11)	(0.23)	(0.10)	(0.24)
80%	0.18*	0.27*	−0.13	0.27	0.17	0.29*
	(0.09)	(0.16)	(0.22)	(0.17)	(0.22)	(0.16)
Interactions						
80%* Organic			0.17		0.14	
			(0.25)		(0.28)	
80%*GM[a]			−0.03		−0.51*	
			(0.28)		(0.30)	
80%*Org*ImpOrg					−0.01	
					(0.25)	
80%*GM*ImpGM					0.93***	
					(0.25)	
Choices	6957		6957		6957	
LL	−5938.88		−5938.27		−5931.72	

Note: Asterisks (*,**,***) indicate statistical significance at the 10%, 5%, and 1% level, respectively.
Abbreviations: GM, genetically modified; LL, log likelihood; RPL, random parameter logit.
[a]GM is a dummy taking the Value 1 if cow and/or feed is GM.

respectively (calculations based on GfK ConsumerScan data). This difference in familiarity is used to test if the impact of market share differs depending on association with GM or other attributes of milk.

Model 2 in Table 3 includes interaction terms between the high market share and each of the GM and organic attributes. Contrary to expectations these interaction terms are statistically not different from zero. However, as heterogeneity in the reactions among individuals may be expected, we further explore this in Model 3, including interaction variables between the respondents' stated importance of their peers' preferences towards GM or organic (first two alternatives in Table 2), the market share and the GM or organic attribute respectively

(*80%*GM*ImpGM* and *80%*Org*ImpOrg*). Contrary to Model 2, this specification improves the model fit compared with the main effects model (Model 1). The high market share parameter (*80%*) is not statistically significantly different from zero while there is a significant standard deviation around the mean. Interestingly, respondents who stated—after having made their decisions—that they believe their peers' choices regarding GM food (*ImpGM*) contain a positive information signal are in fact affected by a high market share for GM in the choice experiment. This reveals that those who state that they interpret their peers' preferences towards GM as a signal are more favorable towards GM when it has a high market share (*80%*GM*ImpGM* = 0 is rejected) and this effect is relatively large in magnitude. This significant interaction term between stated interpretation and actual choices reveals consistency in answers between stated and actual interpretation. The same does, however, not hold for organic, where the interaction term is statistically insignificant. We note that these interaction terms may be subject to endogeneity issues; do respondents answer that market share is interpreted as a signal because they think they were affected in the choice tasks and, hence, answers in a way they think consistent with their choices? Regardless, the results give an indication of a consumer group that does pay attention to peers' behavior, while there is weak support for the hypothesis of larger impact from market share in choices related to attributes that are less familiar.

4.3 | Closeness to market segment affect the impact of market share

The third and final research question asks if consumers are more affected by peer behavior when these peers can be perceived to be more like the consumer themselves, and this is based on the assumption that consumers to a greater extent identify with people similar to themselves. In the experiment, it is assumed that individuals perceive themselves as being more similar to people in their local area than to Danes in general. As revealed in Table 2, there is a statistically significant difference in respondents' interpretation of peers' preferences towards GM and organic food depending on if these peers are described as Danes in general or as those in the respondents' local area. Contrary to prior expectations the preferences among other Danes has a larger impact, and this holds for both GM and organic. To test if these differences are reflected in the choices, and the interaction variable is included in Model 4 (Table 5) between high market share and the local store treatment (*80%*local*). The insignificant interaction term reveals that the effect of high market share is independent of treatment, suggesting that closeness to peers is not important. However, another interpretation is that the two treatments local and Danish are not in accordance with how individuals perceive closeness to peers. Even the local store (larger neighborhood) may be perceived as a fairly large and heterogeneous population, and thus respondents may not differentiate in the (lack of) closeness for the local group compared with the Danish.

We proceed with the second definition of closeness; based on the respondents' self-indicated similarity in preferences with others towards GM food. Results from these questions are presented in Table 4. Respondents are

TABLE 4 Attitudes towards GM food

	1	2	3	4	5[a]	%
Personal attitude towards GM food	0.9	6.7	38.8	36.0	17.7	100
Expected attitude among friends	0.1	2.6	47.1	43.4	6.8	100
Expected attitude among Danes	0.2	3.4	45.0	47.1	4.3	100
		Different		**More positive**		**More negative**
Personal attitude towards GM compared with						
Friends		37.5		14.7		22.8
Danes		48.6		19.7		29.0

Abbreviation: GM, genetically modified.
[a]1 = very positive to 5 = very negative.

on average negative towards GM food, while the average expectation is that friends are less negative and Danes in general even less so. More respondents state that they believe that their attitude towards GM is different from their peers, the broader the definition of peers; 37.5% believe they have different preferences than the average person in their circle of friends, while 48.6% believe that they have different preferences than other Danes on average. More respondents expect to hold more negative preferences towards GM than their peers. Interaction variables are included in Model 5 (Table 5) between high market share, GM, and a dummy indicating if the respondent expects to have different (more positive or more negative) attitudes towards GM compared with others

TABLE 5 Estimation results RPL-models

	Model 4		Model 5	
	Coefficient (se)	Standard deviation (se)	Coefficient (se)	Standard deviation (se)
Price	−0.89***	0.95***	−0.87***	1.14***
	(0.05)	(0.04)	(0.05)	(0.04)
Opt-out	−6.29***	6.33***	−6.19***	6.28***
	(0.34)	(0.36)	(0.32)	(0.34)
Breeding				
GM_GM	−4.95***	4.02***	−5.00***	3.94***
	(0.30)	(0.30)	(0.31)	(0.28)
Conv_GM	−2.97***	3.35***	−2.91***	3.39***
	(0.19)	(0.23)	(0.21)	(0.238)
Organic	1.14***	3.59***	1.03***	3.65***
	(0.18)	(0.21)	(0.18)	(0.21)
Fat content				
Red_fat	0.52***	5.32***	0.52***	5.61***
	(0.19)	(0.28)	(0.20)	(0.29)
Low_fat	1.38***	4.10***	1.35***	4.10***
	(0.17)	(0.22)	(0.16)	(0.22)
Market share (%)				
15	0.09	0.14	0.08	0.42*
	(0.10)	(0.26)	(0.10)	(0.23)
80	0.11	0.23	0.24**	0.29*
	(0.11)	(0.19)	(0.12)	(0.17)
Interactions				
80%*local	0.09			
	(0.17)			
80%*GM[a]			0.12	
			(0.22)	
80%*GM*MoreNeg			−1.00***	
			(0.29)	
80%*GM*MorePos			−0.01	
			(0.33)	
Choices	6957		6957	
LL	−5939.66		−5950.76	

Note: Asterisks (*,**,***) indicate statistical significance at the 10%, 5%, and 1% level, respectively.
Abbreviations: GM, genetically modified; LL, log likelihood; RPL, random parameter logit.
[a]GM is a dummy taking the Value 1 if cow and/or feed is GM.

(*80%*GM*MorePos* and *80%*GM*MoreNeg*). LR-tests reveal significant improvements in model fit compared with the main effects model (Model 1). There is a positive impact in general from high market share, and a substantial heterogeneity as revealed by the relatively large and significant standard deviation. Individuals who expect that they hold more negative preferences towards GM than their peers become even more negative towards GM when such products have a high market share (*80%*GM*MoreNeg + 80%*GM + 80% = 0* is rejected). The same does not hold for individuals who expect that they hold more positive preferences towards GM. This suggests that individuals who believe that their preferences are similar to their peers ("identify with the herd") or are more positive are more prone to follow the behavior of others, and vice versa, that people who believe they are different from most in a critical direction, are likely to not follow the herd.

5 | CONCLUDING DISCUSSION

The objective of this study was to analyze observational learning among individuals in their food purchase decisions, with information about the market share of a product being the source of learning. It has been emphasized in other fields of research that the choices of peers may be interpreted as information. A choice experiment was conducted to analyze the potential impact of peers' choices, where high market shares were used as a proxy to communicate to the respondents that a product is chosen by many of their peers. Results suggest heterogeneity among respondents in how market share affects choice probabilities, and there is a segment of respondents that perceive high market share to carry relevant information for their food purchasing decision. The findings thereby provide some support for the theoretical models (Banerjee, 1992) of conforming behavior.

It was further hypothesized that lower familiarity with a food attribute would increase the likelihood of including market share as information. Data from the survey and choice tasks found weak support for such conclusions. The interaction terms between high market share and the relatively unfamiliar GM attribute was insignificant, suggesting that respondents did not assign different weights to their peers' choices depending on their familiarity with key aspects of the product. Respondents that stated in a survey question that they interpreted peers' choices regarding GM as information were, however, significantly more affected by a high market share for GM in the experiment. The same did not hold for the stated interpretation and actual choices regarding organic, perhaps because many consumers have already made up their minds on this well-known attribute.

Finally, we hypothesized that individuals are more prone to use choices of peers as information when they are more similar to their peers. The experiment was designed to test for this in two ways. First, by dividing the sample into two treatments where the market share presented in the choice tasks referred to the Danish population or to the respondent's local store. There were no statistically significant differences in the choice probabilities related to market share depending on the peer market segment. Interestingly, the second approach revealed significant results; respondents who believe they hold similar or more positive preferences towards GM relative to their peers were positively affected by a high market share. Meanwhile, those who perceive themselves as more skeptical towards GM than their peers were negatively affected by a high market share of GM in the experiment. While the desire among individuals to distinguish themselves from others in their consumption ("snob effects" (Leibenstein, 1950)) is recognized in marketing (Vigneron & Johnson, 1999), such behavior seems to require social interaction. In the setting of this choice experiment, there is no feedback or sharing of choices with other respondents. For these reasons the reverse relationship between market share for GM and the perception of holding more negative preferences than their peers rather seem to be related to information. If this group of respondents identifies themselves as different from their peers they may use market share as information about what not to choose.

While there is rich evidence of conforming behavior in studies based on observational data and experiments in different fields of consumer choice, few studies are designed to disentangle the effect of observational learning from other mechanisms that may drive conforming behavior (Cai et al., 2009). As we stressed above, purchase data

provide information about consumers' food choices, yet such data are of little value for our purpose as confounding variables bar us from crucial inference: Is the market share large because consumers conform to the choices of others, or is it large because consumers find these products superior, that is, have similar individual preferences? If consumers are purchasing food similar to their peers—is it because they have similar preferences or because they learn from each other? These constraining aspects with market data motivated the use of experimental data. We recognize that testing the hypothesis on a hypothetical choice experiment setting implies important limitations. In particular, describing the market share, as opposed to experiencing it, implies lower realism and may be associated with difficulties in interpretation by respondents. Another study has used a similar approach; Carlsson, García, and Löfgren (2010) presented the market share of ecological coffee before a choice experiment. They tested if there were differences in willingness to pay between treatment groups with different levels of market shares. They found a statistically significant effect of the market share among women. Contrary to the current study, the design and purpose in Carlsson et al. (2010) is to use the market share as a signal of norms rather than information (observational learning). In contrast, the design of the current study allows the market share to vary freely among the attributes included, and this construction is used to capture potential observational learning effects from peers' choices. Since the market share is not consistent for any particular attribute across the choice situations, we expect that norms are a less plausible cause for conformity. Moreover, the setup of the data collection ensures that respondents are isolated from their peers; they answer a survey in hard copy or online, with no sharing of the choices made to other respondents. We, therefore, expect that information about the choices made by others is less likely to be perceived as norms, since social norms requires some sort of social feedback or interactions with other members of a group (Bernhard, Fehr, & Fischbacher, 2006). Another approach to inform participants of their peers' behavior was used in a study by Salazar and Oerlemans (2016), where participants in an experimental auction were informed about whether the majority of their peers had chosen eco-labeled laundry detergent or not. Similarly to this study, they found evidence of conforming behavior; participants were affected by information about the choices of the majority of their peers.

The results of this study suggest that the importance of peers' behavior is limited to a segment of consumers. The magnitude of the effect, and the size of the consumer segment, may, however, be understated in the data due to the limitations and difficulties in communicating the real market situation in a hypothetical setting. One may also speculate if respondents unknowingly understate the impact that the market share of a product has on their decision process, as such impacts may not be a conscious consideration, but could be due to more subtle unconscious readings of the information. The results suggest that the inclusion of peer effects in decision-making is not a negligible phenomenon. More research is needed to shed light on the extent this kind of effect plays in individuals' decisions as food consumers, in particular when they are assessing new attributes that may come about, for example, through regulation and trade policy changes or innovation. Other types of data collection or experimental designs may bring further light to the effect of peers' behavior when purchasing food items. In particular, in-store experiments could target an important shortcoming of survey and laboratory settings; as the shelf composition is revealed to the participants directly, signaling popularity for certain product types in a manner that consumers are accustomed to. Another interesting approach is to perform experiments in social media settings, enabling the testing of different impact from peers' behavior based on actual closeness to peers. While this is indeed an interesting source of data, future studies will need to address challenges with endogeneity and restricted control by the researcher.

From a policy perspective, the implications from this study point to the potential importance of individuals perceiving novel production methods and technologies to be widely used and accepted by their peers. Topical subjects that may be affected by early and wide receptions include new breeding methods (e.g., CRISP Cas), insect protein in food, nanotechnology, and in vitro meat, where information about high market shares in other countries may serve as valuable information for consumers about its use and safety. Similarly, providing information about an already high presence in the market for controversial technologies may reassure some consumers of its safety, though likely not all, as our results suggest. Based on the results in this study the effect from peers in the food

decision process appears to be limited to a small segment of consumers, and other sources of information are clearly more important. Further experiments with a policy focus are needed to provide insights on the effectiveness of information on other consumers' choices as a policy tool. In conclusion, the importance of peers' behavior as a source of information is largely neglected in consumer valuation studies. Recognizing and incorporating this source of information under different circumstances may improve understanding of, and ability to predict, consumer behavior. Further, understanding of the mechanisms behind observational learning and the extent that it affects consumers could potentially be used in the design of policy-relevant information strategies.

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ORCID

Anna K. Edenbrandt http://orcid.org/0000-0002-9298-6705
Christian Gamborg http://orcid.org/0000-0003-3150-8280
Bo Jellesmark Thorsen http://orcid.org/0000-0002-3305-8343

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AUTHOR BIOGRAPHIES

Anna K. Edenbrandt, Researcher, Department of Economics, Swedish University of Agricultural Sciences. anna.edenbrandt@slu.se, Box 7013 750 07 Uppsala, Sweden. PhD (Resource Economics), 2018, University of Copenhagen MSc (Economics) 2010, Lund University. Current research interests: Consumer behavior, food economics and policy, individuals' decision-making.

Christian Gamborg, Associate Professor, Department of Food and Resource Economics, University of Copenhagen. chg@ifro.ku.dk Rolighedsvej 25, 1958 Frb. C., Denmark. PhD (Natural resource ethics), 2001, University of Copenhagen. MSc (forestry), 1996, Royal Veterinary and Agricultural University. Current research interests: Natural resource ethics, sustainable land and biotechnology use, conflict management.

Bo J. Thorsen Professor, Department of Food and Resource Economics & Center for Macroecology, Evolution and Climate, University of Copenhagen. bjt@ifro.ku.dk Rolighedsvej 25, 1958 Frb. C., Denmark. Dr. Agro. (DSc Resource Economics), 2007, University of Copenhagen. PhD (Resource Economics), 1999, University of Copenhagen. MSc (Forestry) 1996, University of Copenhagen. Current research: Environmental and resource economics, agricultural and food economics, environmental regulation, and policy.

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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