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Healthy in the Wrong Way: Mismatching of Marketers' Food Claim Use and Consumers' Preferences in the United States but not France

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Health claims on food packaging can focus on the presence of good (vs. the absence of bad) and the preservation of nature (vs. nutritional improvements). We study the frequency of use of four resulting types of claims ("clean," "whole," "diet," and "enriched") in three categories over the past ten years and contrast it with the preferences and associations of American and French consumers. Focusing on breakfast cereals, we find a strong match in France but a mismatch in the United States, where marketers' claim use is negatively correlated with consumers' claim preferences. The mismatch arises from the underuse of presence-focused and nutrition-based "enriched" claims (e.g., "added calcium") and the overuse of absence-focused and nutrition-based "diet" claims (e.g., "low fat"). The mismatch is more pronounced among privately-owned companies than among public companies, which tend to claim that their products are healthy in the way that consumers prefer.

Keywords: Food; Packaging Claim; Retailing; Customer Orientation; Nutrition

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Interest in healthy eating has never been so strong. More than half of consumers say that healthfulness impacts their food shopping more now than it did a decade ago (International Food Information Council 2020). 93% of today's consumers want to eat healthily at least some of the time, and 63% try to eat healthy most or all of the time (Steingoltz, Picciola and Wilson 2018). Responding to this trend, food marketers cover packaging with claims that their products are healthy in one way or another. For example, 95% of breakfast cereals marketed to children in the USA make at least one nutrition-related claim on the packaging (Harris, Thompson, Schwartz and Brownell 2011). However, only 43% of consumers think that food products are generally healthy, and a mere 46% trust food producers (European Institute of Innovation & Technology 2020). Indeed, the growing disagreement over what it means for food to be healthy suggests that marketers' claims about healthy food do not match consumers' expectations.

We summarized the key results of the literature in Table 1. As shown in a recent meta-analysis, consumers find health claims to be generally useful and on the whole claims increase sales and consumption (Kaur, Scarborough and Rayner 2017). However, with few exceptions (Saba et al. 2010; Van Trijp and Van der Lans 2007), studies tend to investigate the effects of a single claim in a specific market. Figure 1 also summarizes the studies that proposed a classification of claims. One influential categorization (Janiszewski, Silk and Cooke 2003; Levin and Gaeth 1988) distinguished between claims that frame the same information as a loss or a gain (e.g., "25% fat" vs. "75% lean"). However, this distinction cannot be used for binary or unquantifiable claims such as "organic" or to compare claims about types of content (e.g., fat vs. preservatives). In the absence of a more general framework to categorize food claims, it is difficult to generalize the findings beyond the focal claim and country.

This research examines the evolution of the ways food marketers have claimed their food is healthy over the past decade, and the preferences and associations of today's consumers about these claims. We investigate the match between marketers' claim frequency and consumers' claim preferences, in addition to company-related factors associated with this match. We build and expand upon a recent framework proposed by André, Chandon and Haws (2019), which classifies claims according to the focus on the presence of positives or the absence of negatives (valence) and whether they are grounded in nutritional improvements or the preservation of the food's natural properties (naturalness).

After showing convergence in marketers' use of claims across three food categories using a novel product database assembled by Mintel Corporation, we focus on breakfast cereals because despite their mediocre nutritional quality (Schwartz, Vartanian, Wharton and Brownell 2008) they are a source of frequent and diverse claims, albeit no single claim dominates another (Costa-Font and Revoredo-Giha 2019). Furthermore, breakfast cereals are international—they are sold and consumed similarly in both countries, which are dominated by the same two large multinational companies. This empirical setting allows us to examine the effects of cross-national differences in demand on customer orientation while holding company and product characteristics constant.

As shown in Table 1, our work contributes to the literature on health claims in three ways. First, we study the supply of food claims and its evolution over the past 10 years thanks to a novel database of the claims made on the packaging of food products sold in supermarkets in three large categories. In contrast, existing research has focused solely on the demand side (e.g., the effects of claims on consumers' associations and purchase intentions) and on one product category and claim at a time.

Table 1
Contribution to the literature on health-related food claims

General findings	Key references	Effect on consumers (demand)	Effects across countries	Effect on marketers (supply)	Matching of supply and demand
	Effects of specific health claims				
Consumers generally see health claims are useful and claims tend to increase sales.	(Kaur, Scarborough and Rayner 2017; Williams 2005)	✓			
Consumers often misinterpret health claims. They generalize positive attributes ("health halos") and negative attributes ("health horns").	(Burton, Cook, Howlett and Newman 2014; Chandon and Wansink 2007; Mariotti, Kalonji, Huneau and Margaritis 2010)	✓			
Health claims can mislead people into choosing less healthy food or increasing energy intake.	(Talati et al. 2018; Wansink and Chandon 2006)	✓			
The effects of health claims vary across products, based on the taste and healthiness inferences made.	(André, Chandon and Haws 2019; Kiesel and Villas-Boas 2013)				
The effects of specific health claims vary across counties.	(Saba et al. 2010; Van Trijp and Van der Lans 2007).	✓	✓		
Health claims have stronger effects among people with obesity, who are motivated and knowledgeable, or who are restrained eaters.	(Andrews, Netemeyer and Burton 2009; Cornil, Ordabayeva, Kaiser, Weber and Chandon 2014; Cornil et al. 2022)	✓			
	Classification of health claims				
Nutrient-specific ("no fat") vs. general claims ("healthy").	Andrews, Netemeyer and Burton (1998)	✓			
Loss ("25% fat") vs. gain-framed claims ("75% lean").	(Janiszewski, Silk and Cooke 2003; Levin and Gaeth 1988)	✓			
Physiological ("heart disease") vs. psychological claims ("stress").	(van Kleef, van Trijp and Luning 2005)	✓			
Functional ("omega 3") vs. hedonic claims ("low fat").	(Belei, Geyskens, Goukens, Ramanathan and Lemmink 2012)	✓			
4 categories based on valence and naturalness of claim.	(André, Chandon and Haws 2019)	✓			
Additive ("added vitamin D") vs. "subtractive" ("skim") claims.	(Rozin, Fischler and Shields-Argelès 2009)	✓	✓		
This paper		✓	✓	✓	✓

Second, our demand-side analyses are more comprehensive than existing studies that are confined to two to three specific inferences (e.g., healthiness and tastiness perceptions, Ikonen, Sotgiu, Aydinli and Verlegh 2020) whereas we measure overall claim preferences and examine 14 functional, hedonic and symbolic inferences.

Third, we compared the United States and France in our supply and demand analyses. We selected these two countries for data availability reasons, but comparing these two countries also allows to contrast the French food culture, which emphasizes moderation and pleasure, while the American food culture which focuses on abundance and comfort (Rozin 2005). This comparison therefore extends the cross-cultural food literature (e.g., Masson, Debucquet, Fischler and Merdji 2016; Rozin 2005) to the study of differences in claim preferences and associations, and hence healthiness perceptions, across two very different food cultures. Finally, we examine the level of matching between the supply and demand of claims, i.e., whether firms make the types of claims that consumer prefer, and their product and company-level antecedents.

Our work also contributes novel insights to the literature on customer vs. stakeholder orientation (Ferrell, Gonzalez-Padron, Hult and Maignan 2010). First, we show that company ownership—private or public—influences whether the company claims to be healthy in the way consumers prefer, or in the way nutritionists or governments recommend (Brownell and Warner 2009; Ludwig and Nestle 2008). We find that publicly listed companies are more customer oriented and less influenced by cross-cultural differences than privately-owned companies, which underuse claims preferred by consumers and overuse "diet" claims based on a reduction in unhealthy nutrients. Finally, we provide a novel and objective measure of customer orientation as the degree of matching between marketer's actual decisions (claim use) and consumer preferences, whereas much of the literature measures customer orientation subjectively, typically through

marketers' self-reports (Jaworski and Kohli 1993; Kohli, Jaworski and Kumar 1993; Narver and Slater 1990).

Conceptual framework

Regulations distinguish between health claims or purported consumption benefits to health (e.g., "calcium contributes to the maintenance of healthy bones") and nutrition claims that emphasize nutritional properties (e.g., "low sugar"). Our research covers regulated health and nutrition claims as well as unregulated claims that position food as healthy (e.g., "all natural"). It does not encompass claims about environmental sustainability, descriptive information such as nutrition facts, or nutrition labels or symbols (for recent studies on them, see Dubois et al. 2021; Maesen, Lamey, ter Braak and Jansen 2022). Nor does it consider warnings about the presence of harmful substances (e.g., "contains GMO," see Kim, Kim and Arora 2021). Our focus is on processed packaged foods (as opposed to fruit and vegetables, or other fresh produce that carry no food claims).

The many ways food products claim to be healthy

Rozin, Fischler and Shields-Argelès (2009) distinguish between "additive" claims that something good (like vitamins) has been added to the product and "subtractive" claims that something bad (such as fat) has been removed. André, Chandon and Haws (2019)—hereafter ACH—extend this framework by arguing that additive claims are a subset of all claims focused on the presence of positives, and subtractive claims are a subset of all claims focused on the absence of negatives. Whereas Rozin et al's claims about "adding positives" and "removing negatives" imply some form of processing, food can be naturally healthy thanks to the active preservation of its natural properties. Hence the ACH framework has two dimensions: valence (the

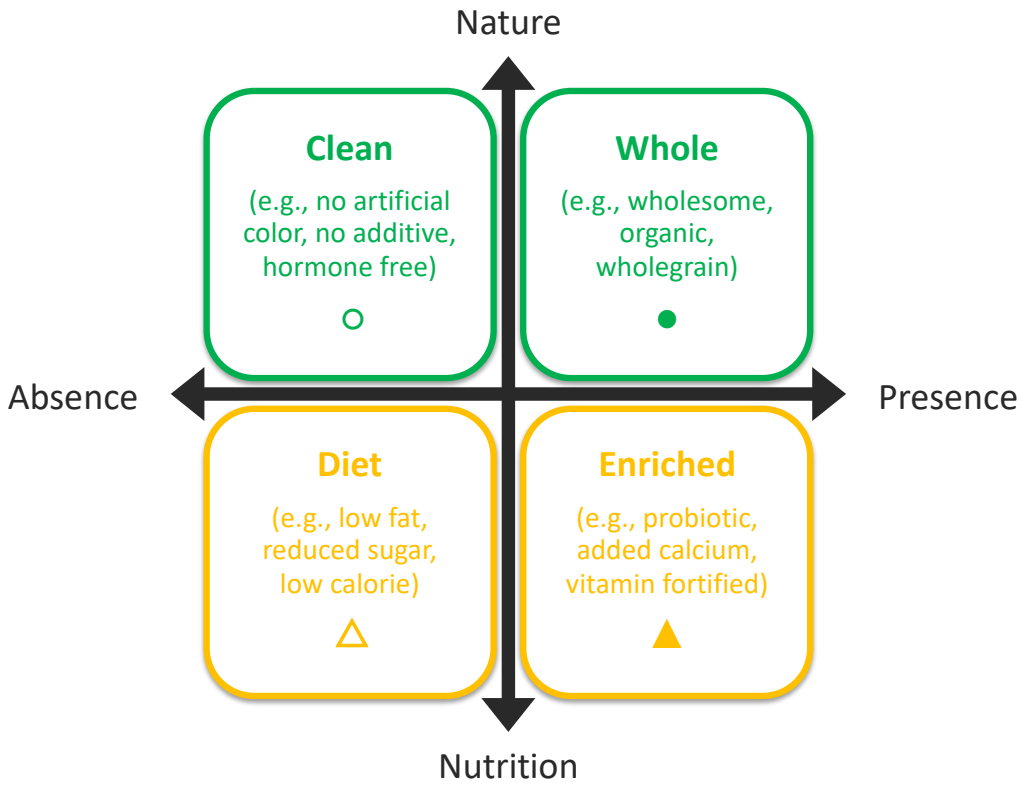
presence of positives vs. the absence of negatives) and naturalness (grounded in natural preservation or scientific improvements), yielding four types of claim. Note that the presence vs. absence distinction is about the content of the food, such as a particular nutrient or production process. This is different from the distinction between framing as a gain or loss (mentioned earlier) which holds content constant (e.g., "25% fat" vs. "75% lean"). Since they pertain to processed and packaged foods, all these claims imply some form of human intervention to make them healthier.

We refine this framework in two ways. First, ACH contrast claims based on "science" with those based on "nature" but do not specify what "science" refers to. To clarify this, we rename "science-based" claims "nutrition-based" to underscore the reference to *nutritional* improvement, either because nutrients (e.g., vitamins, minerals) have been added to the food or because unhealthy nutrients (e.g., fat, sugar) has been removed. This more clearly explains the difference with nature-based claims that make no reference to nutrients but focus on the health benefits of the absence of human intervention. Second, we rename the four types of claims used by ACH ("adding," "removing," "not adding," "not removing") with a focus on the processing (or lack thereof) implied by each claim in favor of more descriptive labels used in the scientific and managerial literature.

In Figure 1, the bottom two types of claim are "nutrition-based": "Enriched" claims imply that the product is healthy because the food has been fortified by adding healthy nutrients, such as vitamins or minerals. "Diet" claims imply that the food is appropriate for a specific diet by removing unhealthy nutrients, such as fat, sugar, or lactose. In contrast, the top two types of claims are "nature-based": "Clean" claims imply the food is healthy because nothing negative has been added (e.g., "no artificial color," "no preservative"), while "whole" claims imply it is healthy because nothing positive, such as the bran from wheat, has been removed (e.g., "wholesome").

Unlike nutrition-based claims, which focus on the presence or absence of nutrients, nature-based claims can be about ingredients (e.g., "palm-oil free"), a type of processing (e.g., "organic"), or more generic (e.g., "all natural").

Figure 1
Four ways food products claims to be healthy



Consumers' claim preferences

While they do not directly measure preferences for each type of claim, André, Chandon and Haws (2019) measure the inferences made by American respondents regarding the taste, healthiness and diet properties of breakfast cereals carrying each type of claim. They find that no claim type dominated on all three dimensions. However, since taste is the number one goal of food buying, ahead of healthiness and dieting considerations (Stewart, Blisard and Jolliffe 2006), we can assume that the type of claim with the most positive taste association is the one that appeals

most to consumers. ACH find higher taste expectations for breakfast cereals that make claims about the presence of something positive (vs. the absence of something negative) and for foods with nature-based claims (vs. nutrition-based claims). Within nutrition-based claims, they find lower taste expectations for "diet" claims (such as "low sugar") than for "enriched" claims (such as "added calcium").

We can therefore make the following hypotheses.

H1a Claim valence: presence-focused claims are preferred to absence-focused claims.

H1b Claim naturalness: nature-based claims are preferred to nutrition-based claims.

H1c Interaction effects: the effect of claim valence is more pronounced for nutrition-based claims, such that absence-focused and nutrition-based "diet" claims are the least preferred.

Like most health claim studies (see Table 1), ACH was conducted among Americans. It is unclear whether the findings are generalizable to other food cultures, such as France, which is at the opposite end of the hedonic-utilitarian spectrum in terms of attitudes to food (Rozin, Fischler and Shields-Argelès 2012). Compared with Americans, the French focus more on the pleasure of eating and less on the nutritional value of food (Masson, Debucquet, Fischler and Merdji 2016; Rozin 2005). For example, Rozin, Fischler, Imada, Sarubin and Wrzesniewski (1999) found that Americans were almost twice as likely as French people to associate a food with its nutritional composition (e.g., "egg" with "cholesterol" or "bread" with "carbohydrates") than with its culinary context or complement (e.g., "egg" with "breakfast" or "bread" with "butter"). Americans are more willing than the French to take a daily pill that satisfies their nutritional needs safely, cheaply and without hunger: 60% of the French never take dietary supplements, whereas 55% of Americans

take one every day (Fischler, Masson and Barlösius 2008), which would suggest that Americans are more open to nutrition-based claims than the French.

There is less cross-cultural evidence regarding the preference for presence vs. absence-focused claims. Rozin, Fischler and Shields-Argelès (2009) found that Americans judged milk with added vitamin D to be more natural than milk with fat removed, whereas it was the opposite among the French, suggesting that the preference for presence-focused claims (over absence-focused ones) is stronger in the United State than in France. However, whether the interaction between naturalness and valence is similar in both cultures remains unknown. Accordingly, we form the following hypotheses.

H2a The preference for nature-based claims (vs. nutrition-based claims) is stronger among French than among American consumers.

H2b The preference for presence-focused claims (vs. absence-focused claims) is stronger among American than among French consumers.

Marketer's claim use

On average, consumers have a positive view of health claims. Consequently, health claims tend to have a positive impact on sales and consumption (Kaur, Scarborough and Rayner 2017). We hypothesize that marketers have noticed the general positive attitude toward health claims and have responded by making more claims and using them on more products. Indeed, there is a burgeoning literature showing that customer orientation increases business performance, be it in terms of innovation or sales and profit (Grinstein 2008; Jaworski and Kohli 1993; Kirca, Jayachandran and Bearden 2005). Food marketers have an incentive to claim that their products

are healthy in the way preferred by consumers. This should lead marketers to increase the number of claims that consumers like most and to decrease the number of claims that are liked less.

H3a Marketers' use of health claim has increased over the past 10 years.

H3b The type of claim used by marketers matches the type of claims preferred by consumers.

We underline that companies are not equally customer oriented. Some downplay or ignore the preferences of their customers, or heed other stakeholders instead (Ferrell, Gonzalez-Padron, Hult and Maignan 2010). In the food domain, and especially for breakfast cereals, these other stakeholders are the nutritionists, media influencers, and consumer advocates of healthier products (Brownell and Koplan 2011; Harris, Thompson, Schwartz and Brownell 2011).

Given that obesity is the number one nutrition problem facing the world (Shekar and Popkin 2020), improving the healthiness of breakfast cereals means focusing on nutrition-based over nature-based claims. For breakfast cereals it means following official dietary recommendations as emphasized in the algorithms of government-sanctioned labeling systems to reduce sugar and fat (Rayner 2017). But if, as hypothesized, absence-focused and nutrition-based "diet" claims about removing sugar or fat are less favored by consumers, a tension between customer and stakeholder orientation arises. Should marketers match consumer preferences for "clean" claims by, say, removing genetically modified organisms (GMOs) or listen to nutritionists demanding less sugar?

Given the business advantages provided by matching customers' preferences, companies that focus on financial/business performance should be more likely to match customer preferences than those with a mission to improve the healthiness of their products. According to the marketing

and strategy literatures, both goals (financial vs. societal) are associated with company ownership: publicly listed companies are more likely to be profit-focused, whereas mission-driven companies are more likely to be privately-owned. There are two major reasons for this. First, investors in publicly traded companies tend to put the maximization of shareholder value above other missions, such as public health (Hawn, Chatterji and Mitchell 2018; Song, Wei and Wang 2015). Second, mission-driven companies are less likely to achieve the size necessary to be listed on the stock market because their investors, customers and employees are concerned about 'mission drift' toward financial objectives when they scale up (Battilana and Dorado 2010; Grimes, Williams and Zhao 2018). Hence our hypothesis:

H4a The degree of matching between consumers' claim preferences and marketers' claim use is higher for publicly traded companies than privately-owned companies.

So far, we have assumed that claim matching (or mismatching) is the result of a deliberate strategy. In addition, mismatching may arise from confusion about the preferences of consumers. This is particularly likely in markets where consumer preferences are complex, such as when naturalness and valence interact to influence claim preferences, rather than when they have a simple main effect. Matching complex customer preferences may be particularly difficult for companies that lack the resources to conduct market research (Zhou, Brown, Dev and Agarwal 2007) or the R&D capabilities to reformulate food products to match those preferences (Moorman, Ferraro and Huber 2012). Because of their larger size and easier access to capital, publicly traded companies should be less affected by the complexity of customer preferences than privately-owned firms. Hence:

H4b The degree of matching between consumer claim preferences and marketer's claim frequency should be reduced by the complexity of customer preferences, especially for privately-owned (vs. publicly traded) companies.

Table 2
Overview of studies

Study	Objectives	Data sources
1	Study 1 examines trends in the frequency of the four types of food claims across multiple food categories in the United States and France over the past decade (H3a).	Mintel (claim-level data)
2	Study 2 is a preregistered study which explains consumers' claim preferences (H1a-H1c) based on their valence and naturalness, as well as differences between the United States and France (H2a-H2b).	Qualtrics panel
3	Study 3 uses SKU-level data to explain claim frequency based on their valence and naturalness. Contrasting with the results of Study 2 allows us to test whether naturalness and valence similarly influence the supply and demand of claims, finding evidence of mismatching in the United States but not in France (H3b).	Mintel (SKU-level data)
4	Study 4 computes an SKU-level index of matching between claim use and preferences, revealing that the US mismatching is driven by the decisions of privately owned American firms (H4a-H4b).	Mintel (SKU-level data)

The stimuli, data and code for all studies are available on the Open Science Framework at https://osf.io/prfmx/?view_only=9f4f18d509dc420395b28ec6c16dd9ed.

Study 1: A longitudinal analysis of food claims frequency in the United States and France

The goal of Study 1 is to compare marketer's frequency of use of the four different types of claims in three large food categories. In contrast with past studies of food claims that ignore

temporal dynamics or tend to focus on one market, we examine the evolution of claim frequency over the past decade in the United States and France.

Data

We rely on a product database assembled by Mintel Corporation that is widely considered as the industry standard but has only been used once in a marketing academic publication (Lim, Rishika, Janakiraman and Kannan 2020). Mintel's database records all the changes made to the packages of products sold in supermarkets at the stock-keeping-unit (SKU) level. It tracks 80 variables, including the product's name and full description, a full list of ingredients, mandatory nutrition information, and packaging visuals and material. Of interest to us, Mintel records food claims made on any side of the package and categorizes them using a standardized list of 105 claims, that are common to all countries. This information is updated when a change is made to the packaging, when a new product is launched, and when a simple change to a visual is made (e.g., a holiday-themed promotion). These packaging changes represent all the opportunities for food marketers to retain or drop an existing claim or add a new claim on a product's packaging. Mintel data therefore captures all decisions made by food marketers regarding food claims on their product's packaging.

We obtained data from three categories: breakfast cereals (including hot and cold cereals), bakery products (including bread & bread products, sweet biscuits/cookies, cakes, pastries & sweet goods, baking ingredients & mixes, savory biscuits/crackers), and baby foods (including baby fruit products, desserts & yogurts, baby juices & drinks, baby savory meals & dishes, baby formula, baby snacks, baby formula, and infant milk). The latter two categories were chosen because they are significantly different from breakfast cereals, our target category, in dimensions such as target customers, consumption occasion, consumption goal (utilitarian or hedonic), category size and

assortment. This allows us to study trends in claim use across a broad section of food categories. Mintel computed the proportion of SKUs with the 105 claims between 2010 and 2019. For example, the proportion of breakfast cereals SKUs in the United States carrying the "no added sugar" claim was 1.55% in 2010 and increased to 5.03% in 2019.

The 105 claims were coded and categorized by the first author and two independent coders who were given the definition of each of the four claim types presented in Figure 1. Inter-coder reliability was high (Fleiss' κ = .74). 71 claims were categorized as unrelated to health (e.g., "carbon neutral," "ease of use"), leaving 34 claims to be classified into the four types. The full list of claims is provided in the Web Appendix 1.

We aggregated the data at the claim type level by summing the claim-level percentages across all the claims belonging to a category (e.g., *Wholegrain, Organic,* and *All-Natural Product* for "whole"). This captures the frequency (not just the presence) of each type of claim, regardless of whether the claims are on the same product or different products. This index can be interpreted as the number of claims of a particular type consumers are likely to encounter on an average product of the category in that year. Consider, for example, two claims that belong to the same type of claims: Claim A is made by 30% of the products and claim B is made by 40% of products. The index for this type of claim is 0.7 (0.3+0.4), indicating that consumers looking at 10 products would encounter 7 claims of that type (claim A 3 times and claim B 4 times), or 0.7 claim per product, on average. Thus, we obtained 240 observations (four types of claims in three product categories and two countries over ten years). Figure 2 plots these observations, averaged over the three categories. Separate charts for cereals, bakery products and baby foods are available in the Web Appendix 1.

Results

We examine whether claim frequency varies across claim type, year, and category by conducting an ANOVA with the claim frequency index as the dependent variable. The independent variables are a four-level categorical variable capturing claim type, a continuous variable for year, country, and a three-level categorical variable capturing category type. Because there was a statistically significant interaction between country and claim type ($F_{3,208}$=3.76, p=.01) and between country, claim type, and year ($F_{3,208}$=3.75, p=.01), we conducted two ANOVAs, one per country, as shown in Table 3. The full results of the ANOVA combining the two countries are available on the OSF page associated with this project.

Table 3
Study 1: ANOVA results for food claim frequency

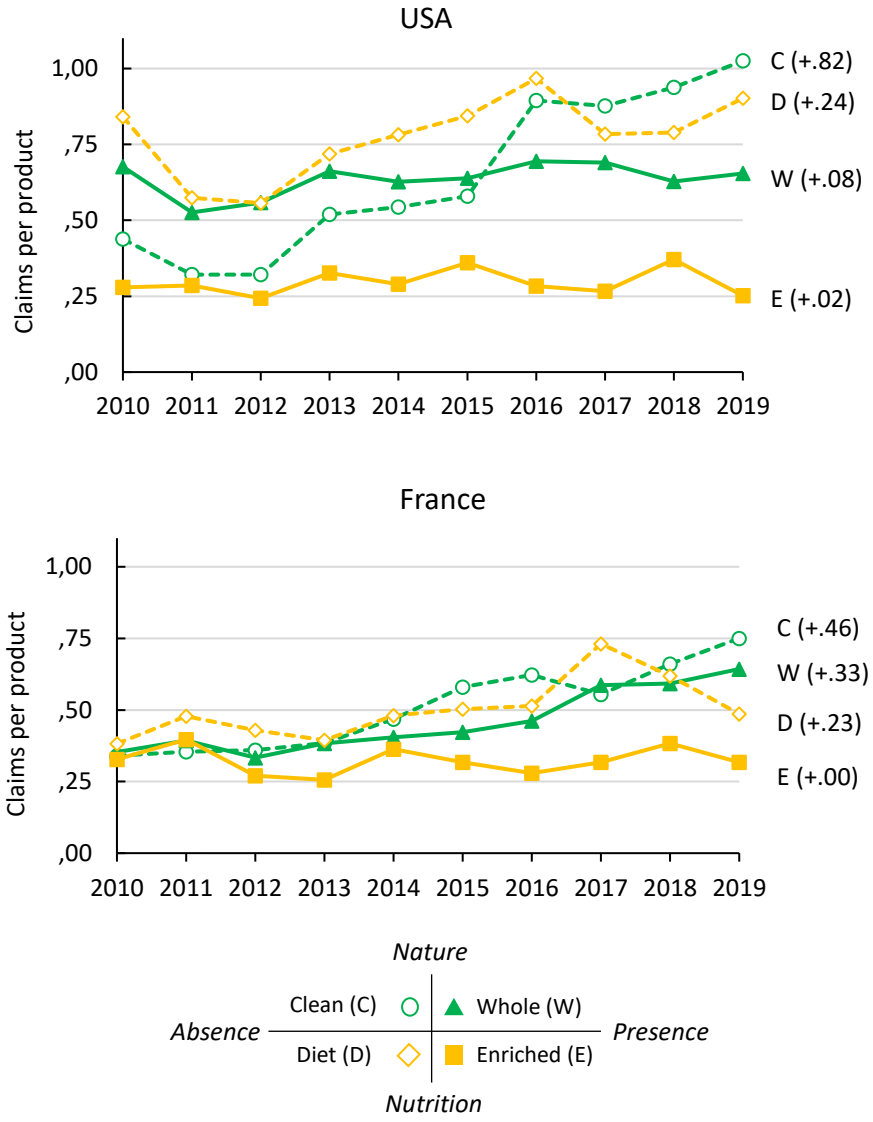
		united states		france	
	df	*F(df,96)*	*p*	*F(df,96)*	*p*
Year	1	66.48	.00	58.99	.00
Claim Type	3	26.00	.00	8.26	.00
Year × Claim Type	3	26.06	.00	8.30	.00
Category	2	5.76	.00	5.82	.00
Year × Category	2	5.83	.00	5.89	.00
Claim Type × Category	6	1.54	.17	1.03	.41
Year × Claim Type × Category	6	1.55	.17	1.03	.41
N		120		120	
R-squared		.90		.88	

As Table 3 shows, the analyses yield the same conclusions in the United States and in France. In both countries there was a statistically significant main effect of year, indicating that claim frequency varied significantly over time. Figure 2 further shows that the total number of claims increased in both countries. French marketers only used 1.40 claims per brand in 2010 in total (vs. 2.23 in the United States), but they have partially caught up. In 2019, they used 2.20 claims vs. 2.83 in the United States. Second, there was a main effect of category (claims were more frequent

for cereals and baby foods than bakery products), an interaction between category and year (claim usage increased the fastest for baby food and the slowest for bakery products), but no interaction with claim type (indicating that the relative frequency of the four types of claims was similar across the three categories). Third, and crucially, the main effect of claim type was statistically significant in both countries, as was its interaction with year, showing that the trends are not the same for the four claim types. Finally, the insignificant three-way interaction indicates that the different trends of each claim type were similar across the three categories (although p=.17 only in the United States, p=.44, than in France and p=.42 when combined both countries, as shown on OSF). It is thus possible to study the differences in trends across claim types by combining the three product categories, as done in Figure 2.

Moving to specific claims, Figure 2 shows that "clean" claims were the fastest growing category of claims across the three categories in both countries, growing by 0.82 claims per decade in the United States and 0.46 in France. These claims are now the most frequent in both countries, albeit at different levels: Americans can expect to see one "clean" claim per product, whereas for the French they occur only on every other product. At the other extreme, "enriched" claims are the least used type of claim in both countries and their use has remained stable (+0.02 claims in a decade in the United States and +0.005 claims in France). Between these two extremes, "diet" claims grew similarly in both countries (by 0.24 claims in the United States and 0.23 in France). Finally, "whole" claims like "wholesome" or "organic" remained in third place in the United States (+0.08) but grew faster in France (+0.33), where they are now the second most popular category.

Figure 2
Study 1: Evolution of claim frequency in the United States (top) and France (bottom)



Note: The charts plot the number of claims that the product is "clean" (C), "whole" (W), "diet" (D), or "enriched" (E) for the average product in three categories (breakfast cereals, bakery products, and baby foods). The values in parentheses are the slopes of a regression with 10 observations for each claim type, which capture the change in the number of claims per average product over the 10-year period. In the United States, for example, consumers could expect to see 0.82 more claims about "clean" over the decade.

Discussion

Study 1 shows increased claim usage in both countries, as expected. It also demonstrates the importance of distinguishing between the four types of health claims, since the four types of claims have different levels of usage and different trends over time in each country. Study 1 shows some

convergence between the United States and France, which have both seen the growing use of clean claims and a stagnation of the much rarer "enriched" claims. Nonetheless, Study 1 shows an important divergence between the two countries, since French marketers have increased their reliance on claims about the other type of nature-based claim, those about "whole" (wholesome, organic), whereas American marketers have not.

Study 1 shows that the trends in the usage of the four claim types are robust across multiple food categories. This is remarkable given the large differences between these categories in terms of target customers, consumption occasion, category size and assortment, as well as in the baseline use of food claims (see the detailed results by category in Web Appendix 1). It is therefore possible to focus on one of these categories and expect similar effects for other supermarket packaged food products.

The results of Study 1 raise the question of why American and French marketers have promoted different kinds of claims over the years. One obvious explanation may be that French and American consumers prefer different claims. We address this question in Study 2 by collecting data on consumer preferences for these four types of claims from two samples of French and American consumers matched on age, gender, income, and education levels. Since Study 1 showed that the trends are similar across food categories, we now focus on one product category, breakfast cereals. As mentioned earlier, we chose this category because it is popular in both countries, dominated by the same companies, and a heavy user of food claims despite a mediocre nutritional quality.

Study 2. Consumers' claim evaluation in the United States and in France

The goal of Study 2 is to examine preferences for the four types of claims among American and French consumers. Study 2 tested 16 claims (4 of each type) and the hypotheses and methods were pre-registered (https://aspredicted.org/blind.php?x=/ZCT_G51). Note that the pre-registration also mentions a sample of Chinese respondents, which was collected before the other two samples and was not pre-registered. The Chinese data are not analyzed in this paper, which focuses on the preregistered differences between the American and French respondents.

To understand preferences for each type of claim, Study 2 also measured the functional (e.g., value for money), hedonic (e.g., taste), and symbolic (e.g., typical user) associations with each claim. This study therefore extends prior work which only looked at three associations (that the food is healthy, tasty, and good for weight loss), for four claims, in one country, and which did not measure the overall preference for the claim.

Method

Study 2 used a 2 (valence: presence vs. absence) x 2 (naturalness: nature vs. nutrition) within-subjects design with two cross-national replications (American vs. French respondents). Participants evaluated four claims about breakfast cereals, one from each claim type. To increase the generalizability of the findings, these claims were randomly selected from a list of 16 claims (four per type). The four "diet" claims were "low fat," "light," "low calories," and "low sugar." The four "adding positives" claims were "high fiber," "high protein," "high antioxidants," and "high calcium." The four "whole" claims were "made with whole grains," "wholesome," "organic," and "all natural." Finally, the four "clean" claims were "no artificial flavor," "no preservatives," "no additives," and "no artificial colors." The selection of the claims was validated

through discussions with the chief nutritionist of a leading breakfast cereal manufacturer. Each respondent sequentially evaluated four claims randomly drawn from each of the four categories.

The impact of claim focus on food preferences was evaluated by asking respondents to rate the extent to which a breakfast cereal with this claim would be "their best choice for breakfast" on a seven-point scale ranging from 1 "strongly disagree" to 7 "strongly agree." We chose to frame the question about their preference for the food making a claim (e.g., "an organic breakfast cereal"), because asking about the claim directly ("organic") could lead respondents to evaluate the desirability of the claim in general but not necessarily the food product itself. Additional analyses (available on OSF) revealed that respondents correctly understood this question as measuring what they would buy, not what they ought to buy.

We then asked respondents to rate whether they expected breakfast cereals with each claim to provide six functional benefits (high quality, satiation, value for money, as well as making them healthier, look their best, and lose weight or stay thin), three hedonic benefits (tasty, indulgent, or boring), and five symbolic benefits (especially appealing to men, to women, to children, perfect for sharing with friends, or just hype). Finally, we measured subjective nutrition knowledge (as in André, Chandon Haws 2019), objective nutrition knowledge (from Moorman, Diehl, Brinberg and Kidwell 2004), and sociodemographic indicators. The stimuli, questionnaire, data, and code are available on OSF. The questionnaire was simultaneously presented in English and in French by the bilingual author team following in-depth pretests with American and French consumers familiar with the product category. The authors consulted with a leading cross-cultural food researcher and with market researchers from the two leading breakfast cereal manufacturers.

We collected data from Qualtrics Panel. As pre-registered, we recruited adults who bought breakfast at least once a year. We screened out participants who failed a main attention check at

the start of the survey asking them to select both the "never" and "often" answer to "How often do you shop for canned food?" We excluded participants who failed 8 attention checks randomly distributed throughout the survey ("If you read this, select strongly agree (disagree)"). We obtained data from 833 respondents (413 American and 420 French), for a total of 3,332 observations, as each respondent evaluated four claims. As designed, the American and French samples did not differ in age (M_{US}=40.06 vs. M_{FR}=41.52 years, p=.61), gender (US: 56% female vs. FR: 54%, p=.59), income (M_{US}=2.99 vs. M_{FR}=2.99 on a 1 to 6 income scale, p=.96) or education level ("Some high school," "High school graduate or GED," "Some college or associate degree," "Bachelor's degree," or "Master's degree or more," p=.27). American and French respondents took the same time to respond to the survey (M=14.4 minutes, p=.09). Additional analyses reported in Web Appendix 2 show that the two samples do not differ in terms of subjective knowledge and purchase frequency, but that American respondents had a higher objective knowledge of nutrition and a higher BMI than the French respondents. They further show that the results reported in the paper hold after controlling for all these individual characteristics. Further interaction analyses reveal that, except for a partial mediation by objective nutrition knowledge, the differences between American and French respondents cannot be explained by the individual characteristics measured in the survey.

The dependent variable was the rating of the claim on the 1-7 point scale on "best choice for breakfast," standardized at the country level to account for differences in response patterns and language, so that it has a mean of 0 and a standard deviation of 1 in each country (Steenkamp and Baumgartner 1998). To account for the nested structure of the data, we estimated the following mixed regression with random intercepts at both the individual and the country levels and

ANOVA-coded binary variables[1]. Specifically, we estimated the following model with subscripts *i* for individual and *j* for country, where *u* are the random effects parameters and *FR* is a binary variable coded as 0.5 for France and -0.5 for the United States:

$$Rating_{ij} = \beta_0 + \beta_1 Presence_{ij} + \beta_2 Nature_{ij} + \beta_3 Presence_{ij} \times Nature_{ij} + \beta_4 FR_{ij} \times Presence_{ij}$$
$$+ \beta_5 FR_{ij} \times Nature_{ij} + \beta_6 FR_{ij} \times Presence_{ij} \times Nature_{ij} + u_i + u_{ij} + e_{ij}$$

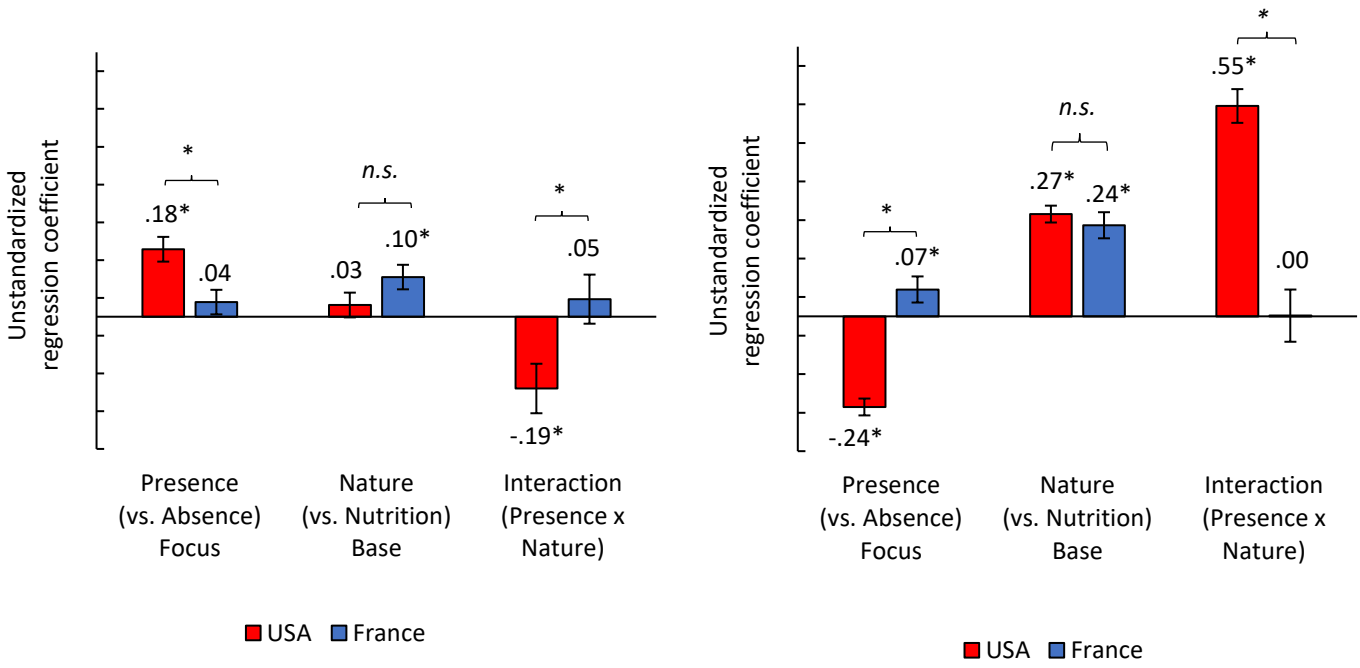
Results

Claim preferences As predicted, presence-focused claims were rated higher than absence-focused claims (β_1=.11, z=4.58, p<.001). Second, nature-based claims were rated higher than nutrition-based claims (β_2=.07, z=2.87, p<.01), as predicted. The interaction between valence and France was statistically significant (β_4=-.14, z=-2.95, p<.01), indicating a stronger preference for presence-focused claims in the United States than in France. The interaction between naturalness and France was in the predicted direction (naturalness was more important in France) but the difference was not statistically significant (β_5=.07, z=1.56, p=.12), contrary to our prediction. The interaction between valence and naturalness (β_3=-.07, z=-1.50, p=.13) was not statistically significant, contrary to our prediction. However, this two-way interaction was qualified by a three-way interaction with France (β_6=.24, z=2.48, p=.01), indicating that the interaction effects of naturalness and valence are not identical in the United States and in France. These results underscore the importance of studying claim evaluation at the country level, as set out below.

Figure 3
Effects of claim focus on claim preferences (left) and frequency (right) by country

Claim preferences (Study 2: Consumers) | Claim frequency (Study 3: Marketers)

[1] Note that the main effect of country is omitted because ratings were standardized at the country level. In the pre-registration, we had indicated that we would use dummy coding. Because of the lack of interaction between naturalness and valence, estimates of the main effects were very similar when using dummy coding (β_1=.14, z=4.26, p<.001 and β_2=.10, z=3.07, p=.002) and the interaction effect is naturally unchanged. We report the results for ANOVA-coded variables to be consistent with the analyses of claim frequency.

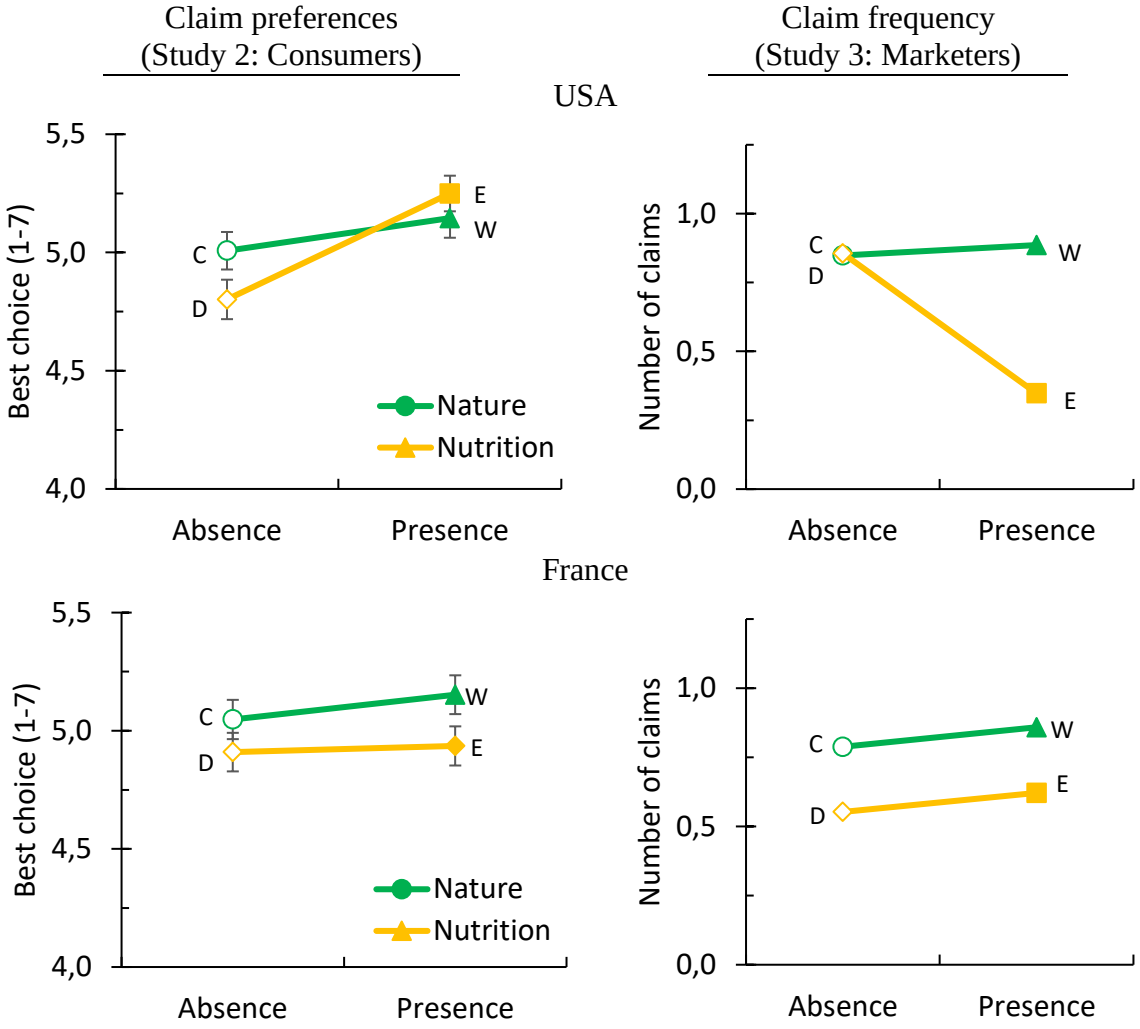


Note: Claim preferences are "Best choice for breakfast" ratings (mean and standard errors), standardized per country. Claim frequency is the average number of claims per product between 2017 and 2019. Sample size in Study 2: N_{USA}=413 N_{France}=420; and in Study 3: N_{USA}=1324 N_{France}=552. Error bars represent standard errors. *: Indicates that the regression coefficient is statistically different between the United States and France at the 5% level.

The country-level regression parameters are shown in the left panel of Figure 3. The asterisks in Figure 3 shows whether each coefficient is statistically different from zero and whether the regression coefficient in one country is statistically different from the corresponding coefficient in the other country (i.e., the interaction effects by country reported above). To help the interpretation of these effects, the left panel of Figure 4 shows the mean claim rating on the original 1-to-7-point scale in the United States (top) and France (bottom).

Figures 3 and 4 show that in the United States presence-focused claims were preferred over absence-focused ones (β_{US}=.18, z=5.12, p<.001); the main effect of naturalness was not statistically significant (β_{US}=.03, z=.89, p=.37) but there was a statistically significant crossover interaction with valence (β_{US}=-.19, z=-2.71, p<.01). As shown in Figure 4, naturalness improved the rating of absence-focused claims ("clean" claims were rated above "diet" claims) but reduced the rating of presence-focused claims ("whole" claims were rated below "enriched" claims).

Figure 4
Mean claim preferences (left) and frequency (right) by country



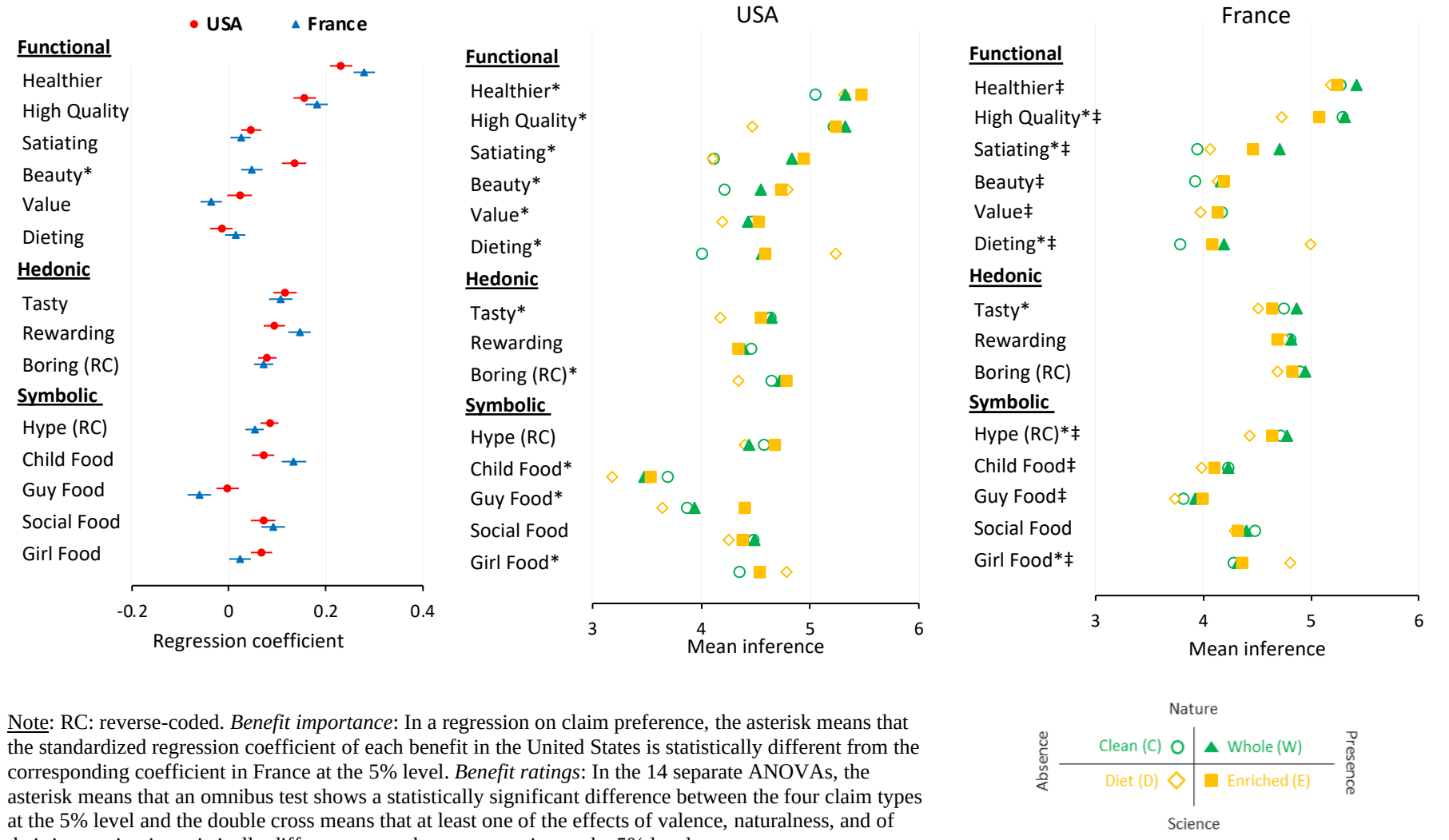
Note: Claim preferences are "Best choice for breakfast" ratings (mean and standard errors) for breakfast cereals claiming to be healthy because they are "clean" (C), "whole" (W), "diet" (D), or "enriched" (E). Claim frequency is the average number of claims per product between 2017 and 2019. Sample sizes in Study 2: N_{USA}=413 N_{France}=420; and in Study 3: N_{USA}=1324 N_{France}=552.

A different pattern was observed in France. As shown in Figures 3 and 4, the main effect of valence was not statistically significant (β_{FR}=.04, z=1.21, p=.23), the main effect of naturalness was statistically significant (β_{FR}=.10, z=3.26, p=.001), and their interaction was not statistically significant (β_{FR}=.05, z=.72, p=.47). In France, there was a strong preference for nature-based claims over nutrition-based ones and the valence of the claim did not matter.

Understanding claim preferences The ratings of each of the 16 claims on the 14 benefits and on the overall claim rating are provided in Web Appendix 1. We examined whether American and French respondents preferred different types of claims because they perceive each type to deliver different benefits (e.g., satiation, taste, etc.) or because they value these benefits differently when rating the overall attractiveness of the claim. We addressed the latter question first by regressing claim preference on the 14 benefit ratings in each country, standardized at the country level, a binary variable for country, its 14 interactions with each benefit using valence and naturalness, and their interactions as control variables.

As shown in the left panel of Figure 5, the best predictors of preferences are expectations that the food will make people healthier and that the food is high quality, two functional benefits. Among hedonic benefits, the strongest predictors were expectations that the food will be tasty and provide a sense of indulgence. Symbolic benefits were only weakly associated with preferences. Crucially, Figure 5 shows that with one exception (beauty benefits), none of the coefficients were statistically different between the two countries at the 5% level. This shows that claim preferences are driven by the same benefit inferences in both countries.

Figure 5
Inferences about the functional, hedonic, and symbolic benefits of the food products



Note: RC: reverse-coded. *Benefit importance*: In a regression on claim preference, the asterisk means that the standardized regression coefficient of each benefit in the United States is statistically different from the corresponding coefficient in France at the 5% level. *Benefit ratings*: In the 14 separate ANOVAs, the asterisk means that an omnibus test shows a statistically significant difference between the four claim types at the 5% level and the double cross means that at least one of the effects of valence, naturalness, and of their interaction is statistically different across the two countries, at the 5% level.

On the other hand, the center and right panels of Figure 5 show that American and French respondents tended to make different inferences about all the functional benefits delivered by the four claim types (indicated by ‡). For example, Americans rated clean claims significantly lower on healthiness, whereas French respondents rated all claims equally on this benefit. Similarly, Americans expected "enriched" cereals to have the same quality and satiating properties as those with "whole" claims, whereas the French always rated the "whole" claims higher. American and French respondents also made different inferences about the symbolic benefits of each claim type (except for the "social food" inference that the cereal would be "perfect for sharing with friends"). Last, the four types of claims were perceived similarly in both countries in terms of their hedonic benefits.

Discussion

Study 2 shows that both American and French consumers prefer different types of claims. French consumers prefer nature-based claims that the product is healthy because its natural properties have been preserved, irrespective of whether it was done by not removing positives ("whole" claims) or by not adding negatives ("clean" claims). The preferences of Americans on the other hand are mostly influenced by the valence of the claim. Americans prefer claims about the presence of positives rather than the absence of negatives. Valence also influences the effects of naturalness. Among presence-focused claims, Americans prefer the nutrition-based claim that products have been fortified or enriched, which are the most liked type of claim overall, rather than by not removing positives ("whole" claims). Among absence-focused claims, Americans reject "diet" claims, which are the least preferred type of claim.

Study 2 therefore reveals differences between American and French consumers for the different ways foods claim are perceived to be healthy. These inferences are consistent with prior

results showing that the French food culture is more focused on naturalness than its American counterpart (Rozin, Fischler and Shields-Argelès 2012). These inferences go beyond this by showing that Americans' preferences for the ways foods claim to be healthy has three tiers. The first tier consists of foods that claim to have been fortified by adding positives. The second tier comprises the two nature-based claims of "clean" or "whole." The third and least preferred tier consists of foods with "diet" claims. These are new results that were absent from prior work on the four types of claims (André, Chandon and Haws 2019), which did not measure the overall preference for each claim type.

The inference analyses further demonstrate that American and French respondents prefer different kinds of food claims because they expect them to deliver different functional and symbolic benefits but similar hedonic benefits, not because they value these benefits differently. For example, the four claim types are rated differently in terms of their expected associations with the healthiness and quality of the cereals that make these claims, which is why some claims are preferred to others. These marked differences should make it easy for marketers to choose the claims that people prefer in each country. Study 3 examines whether that is the case.

Study 3: Matching of marketers' claim frequency and consumers' claim preferences

Study 3 examines whether and when the supply of food claims matches consumer preferences for each type of claim. To achieve this goal, we conduct the same analysis preregistered for Study 2 about claim preferences but do it with respect to claim frequency. This analysis relies on disaggregate data provided by Mintel in each country. Compared to the aggregate-level data about the proportion of products carrying each claim per year used in Study

1, the data used in Study 3 provides information about the exact claims made by each SKU in the category, in addition to a host of additional information about the products and their producer. We use this data to examine when there is a match or a mismatch between the frequency and preferences for each type of claim.

Method

Study 3 used SKU-level information provided by Mintel on the claims listed on the packaging of breakfast cereals in American and French supermarkets. As indicated earlier, each observation in this data captures a change in one of the 80 packaging-related variables tracked by Mintel and represents an opportunity for food marketers to remove, add, or change a claim.

Our dependent variable is the number of claims of each type per SKU. For example, one package of 55 oz. General Mills Honey Nut Cheerios available in 2019 at $7.79 carried one "whole" claim ("wholegrain") and two "diet" claims ("free from gluten" and "low in cholesterol"), in addition to other claims unrelated to health (e.g., "kosher certified"). To account for the fact that not all products have a package change every year, and broaden the data beyond one year, we used data for the 2017-2019 period. If a specific SKU appeared more than once during that period (i.e., was modified more than once), we used the most recent observation. After removing chilled and frozen cereals (24 SKUs), the final sample consisted of 1,876 SKUs (1,324 in the United States and 552 in France). Since we have four observations per SKU (the number of claims of each type), the total number of observations was 7,504.

To examine the drivers of the frequency of each claim type, we use the same regression analysis as in Study 2. The dependent variable is the number of claims of each type per SKU (a number ranging from 0 to 7). Unlike claim preferences, which were measured on a Likert scale, claim count is not subject to translation or language biases and is therefore not standardized at the

country level. To account for the nested structure of the data (4 observations per SKU), we estimated a mixed regression with random intercepts at both the country and the SKU-within-country levels. We used a linear model to facilitate the comparison with the linear model used for claim preferences (which were measured from 1 to 7), but the results are similar using a Poisson regression. We estimated the following regression with subscripts *i* for countries and *j* for SKU, with the same ANOVA-coding for all variables as in Study 2.

$$Frequency_{ij} = \beta_0 + \beta_1 Presence_{ij} + \beta_2 Nature_{ij} + \beta_3 Presence_{ij} \times Nature_{ij} + \beta_4 FR_{ij} + \beta_5 FR_{ij} \times Presence_{ij} + \beta_6 FR_{ij} \times Nature_{ij} + \beta_7 FR_{ij} \times Presence_{ij} \times Nature_{ij} + u_i + u_{ij} + e_{ij}$$

Results

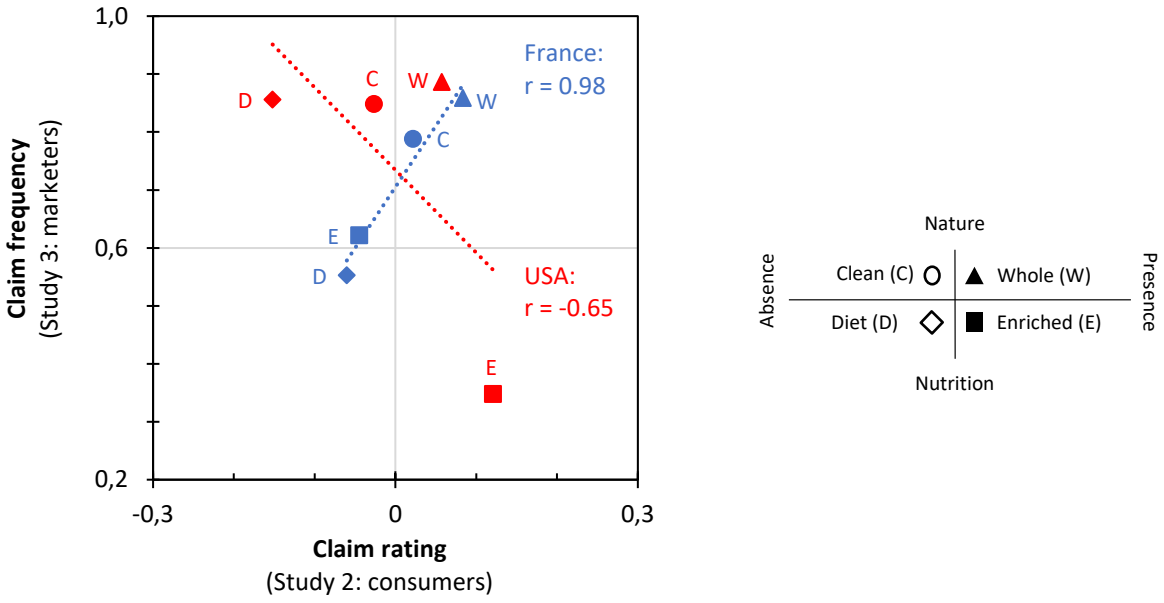
Across both countries, presence-focused claims were less frequent than absence-focused claims (β_1=-.08, z=-4.10, p<.001) and nature-based claims were more frequent than nutrition-based claims (β_2=.25, z=12.44, p<.001). The interaction between valence and naturalness was also statistically significant (β_3=.27, z=6.79, p<.001), but was qualified by a significant three-way interaction with France (β_7=-.54, z=-6.75, p<.001), indicating that the interaction effects of naturalness and valence were not identical in the United States and in France. The main effect of France was not statistically significant (β_4=-.03, z=-1.06, p=.29), nor was its interaction with naturalness (β_6=-.03, z=-.72, p=.47). However, the interaction between France and valence was statistically significant (β_5=.31, z=7.56, p<.001). As for claim preferences, these results underscore the importance of studying claim frequency at the country level, as set out below.

The right panel of Figure 3 shows the unstandardized regression coefficients while the right panel of Figure 4 plots the mean frequency of each type of claim and each country for the 2017-2019 period. In the United States, presence-focused claims were less frequent than absence-

focused claims (0.62 vs. 0.85 claims per product, β_{US}=-.24, z=-11.02, p<.001) whereas nature-based claims were more frequent than nutrition-based ones (0.87 vs. 0.60 claims per product β_{US}=.27, z=12,43, p<.001). There was a statistically significant interaction between naturalness and valence in the United States (β_{US}=.55, z=12.79, p<.001). As shown in Figure 4, a nutrition-focus reduced frequency for presence-based claims (there were only 0.35 nutrition-based "enriched" claims per product, significantly less than the 0.89 nature-based "whole" claims) but did not influence claim frequency for absence-focused claims (0.86 "diet" claims vs. 0.85 "clean" claims).

There was a different and simpler pattern in France. As shown in Figures 3 and 4, the impact of valence only approached statistical significance (β_{FR}=.07, z=1.95, p=.05). In contrast, naturalness had a large and statistically significant effect (0.82 nature-based claims per product vs. 0.59 nutrition-based claims, β_{FR}=.23, z=6.61, p<.01). The interaction of nature and valence was not statistically significant (β_{FR}<.01, z=.03, p=.98).

Figure 6
Association between claim preference (Study 2) and claim frequency (Study 3)



Note: Dotted lines are trendlines by country. Sample sizes in Study 2: N_{USA}=413 N_{France}=420; and in Study 3: N_{USA}=1324 N_{France}=552.

To visualize the match between claim preference and frequency, Figure 6 plots the average number of claims per product between 2017 and 2019 on the vertical axis and the standardized measure of claim rating ("best for breakfast") on the horizontal axis. It shows that claim preferences and frequency are aligned in France, where claims that are rated high by consumers are also more frequently used by marketers. As a result, the correlation between the two measures across the four data points is 0.98 in France. In the United States however, there is a stark mismatch between claim preferences and frequency. The most-preferred "enriched" claims are the least frequent whereas the least-preferred claims, those about "diet," are very frequently used. Hence, the correlation between preference and frequency is negative in the United States (r = -0.65).

Discussion

Study 3 shows that claim preferences and frequency are aligned in France but not in the United States. The results of Study 1 rule out the possibility that these effects could be explained by American food marketers being slow to adjust to consumer preferences, since the trends in claim use in the United States are going in the opposite direction. The number of the most liked "enriched" claims remained stable rather than increasing. Conversely, the number of the least liked "diet" claims has increased since 2010 in the United States. Study 4 examines which food marketers fail to position their products on the type of claim that consumers prefer and continue to use claims that are less preferred.

Study 4: When are claim frequency and preferences mismatched?

Study 4 examines some of the product, brand, and company-level antecedents of the match or mismatch between claim frequency and preferences in the United States and France. It uses a

disaggregate SKU-level measure of mismatch to test our hypotheses that matching is higher among public than among private firms (H4a) and that matching is lower in market with complex consumer preferences, especially among private firms (H4b). According to this hypothesis, matching should be lower in the United States, where there is a crossover interaction of valence and naturalness in terms of preferences. Thus, American marketers cannot simply base their claims on nutrition, since nutrition-based claims are only preferred to nature-based ones when they focus on the presence of positives, not when they focus on the absence of negatives (in which case, nutrition-based claims are dominated by nature-based claims). In contrast, the preferences of French consumers are simple and easy to figure out: They prefer nature-based claims to nutrition-based ones and do not care about the valence of the claim. H4b therefore also predicts larger differences between public and private firms in the United States than in France.

Method

Study 3 estimated the match between claim frequency and preferences at the aggregate level, by comparing the average preferences for each type of claim with its average frequency in each country. In Study 4, however, we computed a matching index at the SKU level based on whether the number of claims of each type on the product's package matches consumers' preferences. Since claim preferences in France are entirely driven by naturalness, a French SKU was considered matching (coded 1) if the number of nature-based claims ("clean" and "whole") was larger than the number of nutrition-based claims ("diet" or "enriched") and coded 0 (mismatching) otherwise. In the United States, preferences are the highest for "enriched" claims and lowest for "diet" claims. The other two types of claims ("clean" and "whole") are rated in between and are not significantly different from each other. We therefore consider that a US SKU is matching if it has more "enriched" claims and fewer "diet" claims than the mean of "clean" and "whole" claims.

We gathered data on company ownership from Orbis (orbis.bvdinfo.com), S&P Capital IQ (www.capitaliq.com), and Refinitiv Eikon (eikon.thomsonreuters.com). We classified companies as public if they were listed as such by at least one of these three sources during the entire study period (2017-2019). The list of 22 public companies (13 companies operating in the United States only, 5 operating in France only, and 4 operating in both countries) is given in Table 4. The other 240 companies were classified as private (140 companies operating in the United States only, 94 operating in France only, and 6 operating in both countries).

We conducted a series of logistic regressions with matching as the dependent variable and a dummy-coded binary variable for ownership (1 for public and 0 for private). To examine country differences, we added a binary variable (USA, deviation coded) and their interaction. The control variables were the subcategory (a dummy variable equal to 1 for cold cereals and 0 for hot cereals), the size, and the price of the SKU (standardized at the country level). To account for nutritional differences, we also incorporated the amount of carbohydrates, also standardized at the country level, which is the main nutritional differentiator in this category (Bandy, Scarborough, Harrington, Rayner and Jebb 2021). Finally, we estimated the brand's size by computing the number of SKUs per brand, log normalized to account for high skewness. The parameters of the regressions are available in Table 4. Because of missing values (54 SKUs in the United States and 4 in France), the number of observations was 1,270 in the United States and 518 in France (1,788 in total).

Results

Table 4 shows that, when pooling the data across the two countries the coefficient of the public ownership was positive and statistically significant, as predicted by $H_{4a,}$ hence the likelihood of a match was higher if the SKU belonged to one of the 22 publicly owned company than if it

belonged to a private company. The negative coefficient for the variable "USA" shows that the likelihood of matching was lower in the United States than in France, as predicted. In fact, the number of matching SKUs was 29.8% in the United States vs. 46.0% in France. The positive interaction shows that the effects of company ownership differed across the two countries, as predicted by H_{4b}. It means that the difference between public and private companies was stronger in the United States than in France. Stated differently, it means that the difference between the United States and France was stronger for private companies than for public ones.

To better understand the drivers of matching in each country, Table 4 shows the results of separate logistic regressions conducted in each country. In the United States, the effects of company ownership were large and strongly significant (p<.001). As shown in Table 5, 41.8% of the SKUs belonging to public American companies were matching vs. only 17.3% for private companies. In France, however, the effect of public ownership was not statistically significant (p=.08), indicating that matching was similar for public (49.3%) or private (44.0%) companies, as can be seen in the logistic regression coefficients shown in Table 4.

Table 4
Study 4: Effects of company ownership on SKU-level matching

	All			United States			France		
	Coef.	*z*	*p*	*Coef.*	*z*	*p*	*Coef.*	*z*	*p*
Ownership structure									
Public (vs. private)	.79	6.72	<.01	1.27	9.11	<.01	.36	1.76	.08
USA (vs. France)	-1.33	-8.09	<.01						
Public × USA	.87	3.77	<.01						
Covariates									
Cold cereals	.05	.31	.76	.06	.39	.69	.05	.10	.92
Standardized package size	.17	2.18	.03	-.02	-.21	.83	.42	3.18	<.01
Standardized price	.19	2.75	<.01	.10	1.15	.25	.31	2.47	.01
Standardized carbs	.29	5.62	<.01	.19	3.05	<.01	.49	4.99	<.01
Log # of SKUs per brand	.07	1.29	.20	.02	.41	.68	.20	1.66	.10
Intercept	-1.08	-6.12	<.01	-1.70	-8.49	<.01	-.56	-1.22	.22

Likelihood ratio test	$\chi^2(8) = 185.12$, $p<.001$	$\chi^2(6) = 108.93$, $p<.001$	$\chi^2(6) = 48.99$, $p<.001$
Pseudo R-squared	.08	.07	.07
Number of observations	1,788	1,270	518

Note: The 22 public companies are: Associated British Foods[2], Ahold Delhaize[1], Amazon[1], B & G Foods[1], Carrefour[2], CVS Health[1], Del Monte[1], Funko[1], General Mills, Groupe Casino[2], Hain Celestial Group[1], Kellogg's, Kroger[1], Marks & Spencer[2], Nestlé[2], Otsuka Holdings[2], PepsiCo, Post Holdings[1], Southeastern Grocers[1], Target[1], Wal-Mart[1], and WW International[1]. [1]: Operating in the US only. [2]: Operating in France only. Post-estimation analyses revealed that multicollinearity was not a concern with VIF values for the independent variables ranging from 1.02 to 2.13.

The coefficients of the control variables show no difference between cold and hot cereals and no effect of the size of the brand (the number of SKUs), but the likelihood of matching also increased with the amount of carbs. The effects of the other variables were not robust across countries. More expensive SKUs and those sold in larger packages tended to have a stronger matching in France but not in the United States. All the comparisons between public companies and private companies yielded the same conclusions with and without covariates.

As a robustness check, we computed the correlation between claim preferences and average claim frequency for private and public companies. The results mirror those of the SKU-level analyses. In the United States, the correlation was negative among private companies (r=-0.90) and positive among public companies (r=0.25). In France, it is positive for both private (r=0.66) and public companies (r=0.49). As another robustness check, we examined in Web Appendix 5 the level of matching across groups of companies of different sizes: The top 2 producers (Kellogg's and the alliance between General Mills and Nestlé), large producers, large retailers, and small producers. We found a lower level of matching for small American producers than in the three other groups, but a similarly high level of matching in France regardless of company size.

Table 5
Study 4: Matching likelihood and number of claims by company type

Category	# SKUs (%)	Matching (%)	Number of claims per SKU (2017-2019)				
			Clean	Diet	Whole	Enriched	Total
United States							
Public companies	675 (51%)	41.8%	0.51	0.35	0.80	0.33	1.98
Private companies	649 (49%)	17.2%**	1.20**	1.38**	0.98**	0.37	3.93**
France							
Public companies	211 (38%)	49.3%	0.98	0.20	0.73	0.83	2.75
Private companies	341 (62%)	44.0%	0.67**	0.77**	0.94**	0.49**	2.87

Note: *: The number of claims is statistically different between public and private companies at the 1% level.

To examine which types of claims are driving the lower matching for private companies, we report in Table 5 the number of claims of each type for public and private companies. Table 5 shows that private American companies tend to make a lot more claims (3.94 per product on average) than public American companies. The strongest difference between private and public companies is for "diet" claims, which are used almost four times more by private companies (1.38 per product on average) than by public ones (0.35 per product). In contrast, private companies do not make more "enriched" claims than public ones. In France, in contrast, the number of claims is about 2.8 per product regardless of company ownership, and so the differences in the types of claims made by private and public companies are not that large.

Discussion

Study 4 shows that the higher level of mismatching in the United States arises from the decisions of private American companies to make many "diet" claims, even though these are the least appealing to American consumers. Figure 7 shows that the mismatching by private US firms cannot be explained by a slowness to adapt to consumer preferences since these firms have

maintained a high usage of "diet" claims throughout the past 10 years. Rather, they suggest a significant and persistent difference in claim usage between private and public cereal companies. This cannot be explained by differences in the price, size, or carbohydrate composition of their products or by the size of the brands (as measured by the number of SKU variants) since these factors are controlled for in the analysis. However, we note that important predictors (e.g., marketing spending) may be missing from this model.

Study 4 also shows that public companies make fewer claims than private companies in both countries and yet have the highest matching rates. This suggests that matching can be achieved without making many claims if they are the correct ones. Finally, Study 4 shows that matching is more frequent for breakfast cereals with more carbohydrates which make fewer "diet" claims. In fact, most of the variation in matching comes from "diet" claims. Claims about "enriched," though the most preferred, are uniformly rare in the United States. In the general discussion, we speculate about the reasons why private American companies make so many "diet" claims and therefore have such a low match with the preferences of American consumers.

General discussion

The past 10 years have witnessed a parallel increase in the number of claims made that food products are healthy and a decrease in consumer trust that they really are. Our results suggest that part of the paradox may be caused by disagreement in what 'healthy' means. Drawing on a 2 x 2 categorization of food claims depending on whether they focus on the presence of good (vs. the absence of bad) and are justified by the preservation of nature (vs. nutritional improvements), we show the emergence of new ways food marketers claim that their food is healthy and document that consumers do not value all claims as similarly healthy.

We further show that American and French consumers do not prefer the same claims because they make different inferences about what these claims mean for the functional and symbolic consumer benefits of these brands, not because they value these benefits differently. Finally, we find a match in the type of health claims made by marketers and those valued by consumers in France, but a mismatch in the United States. We show that this mismatch is driven by the behavior of privately-owned American firms, which make many more claims than publicly listed companies, but do not make the type of claims that consumers prefer.

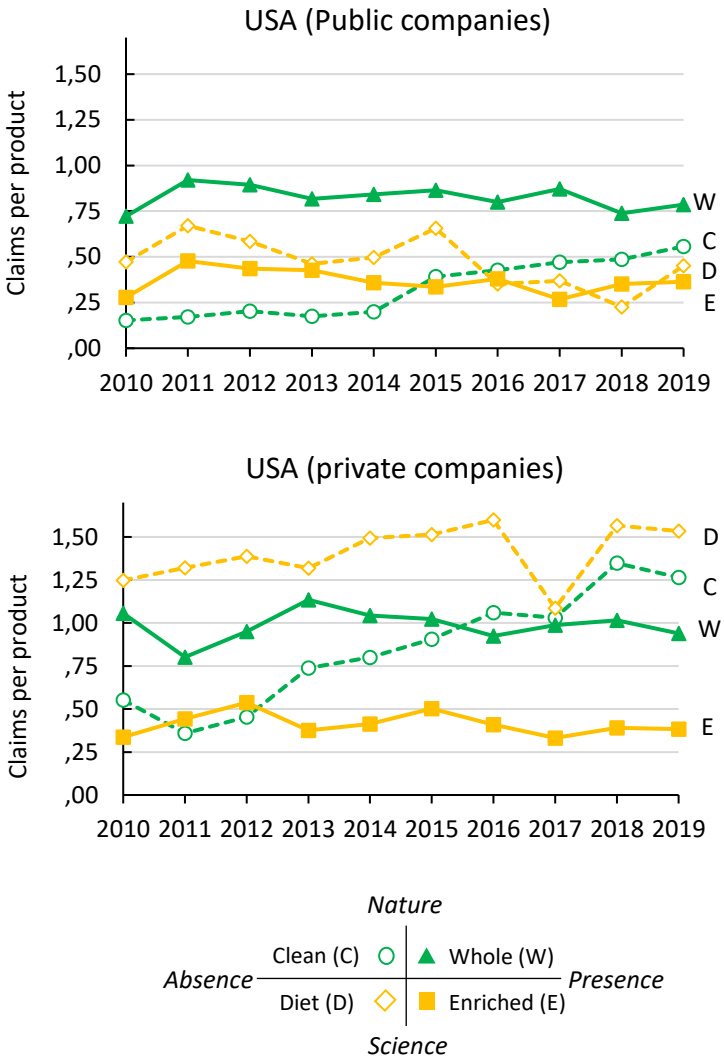
Explaining the mismatch between claim frequency and preferences in the United States

There are at least three reasons why private American firms use food claims that are not those most valued by American consumers. An obvious explanation is that these firms are trying to differentiate themselves from the larger public companies, which tend to use the claims that most consumers prefer. Differentiation, however, should also be a worthy goal for private French companies. Yet, French privately-owned companies make the same kind of claims that French public companies make. This occurs even though both markets are comparable. The two giant publicly listed companies in this category, Kellogg's and General Mills, have the same market share in the United State and in France and, as shown in Web Appendix 5, they make claims that are aligned with consumers' preferences in both countries. Private French companies would have the same reason to differentiate themselves from the large two public leaders as American companies. The differentiation argument fails to explain why private American firms would not differentiate themselves from the large public firms by increasing the number of "enriched" claims, which are valued by consumers but underused by public firms, rather than making more of the less-liked "diet" claims. In conclusion, the differentiation argument does not explain why private

American cereal makers differentiate themselves by using a claim that consumers dislike rather than one they prefer.

Another explanation is that private firms are confused about consumer preferences or cannot match them because they lack the market research resources and food reformulation expertise of larger, richer publicly listed companies. However, further analyses reveal that the "resource" arguments cannot account for the differences between the United States and France. First, we measured the evolution in claim use by private and public American companies over the past 10 years. If private companies had really been confused about the preferences of American consumers, or if they had needed more time to adapt to them by reformulating their products, we would have seen a gradual evolution toward the type of claims preferred by American consumers. Instead, Figure 7 reveals that private companies have increased their reliance on "diet" claim while continuing to underuse "enriched" claims.

Figure 7
Study 4: Evolution of claim frequency for public and private American companies



To further probe the "confusion" hypothesis, we used Euromonitor data to estimate the size of brands belonging to public and private companies in each country. We estimate the revenues of private companies at $2,016 million in the United States (a 16% share of the market) and at $245 million in France (30% of the market). Given the number of SKUs owned by each type of company (shown in Table 5), private American companies generated $3.1 million in sales per SKU vs. only $0.72 million per SKU for their French counterparts. Although some American private firms are undoubtedly very small, these results suggest that privately owned American companies should

have as many resources as their French counterparts to conduct market research and should therefore be equally likely to realize that the "diet" claims that they overuse are rated poorly by most American consumers.

A third potential explanation is that private American companies are less market-oriented than their French counterparts because they are more driven by a mission to improve the nutrition of their products and the health of their customers. To explore this conjecture, we coded whether the company names themselves referred to nutrition or health. We found that 14 of the 146 private firms operating in the United States (9.6%) had a corporate name related to health or nutrition, such as "Low Karb." In contrast, only 3 of the 100 private firms operating in France (3.0%) had a name related to health or nutrition (e.g., "ABCD Nutrition"), a statistically significant difference ($\chi^2(1)=4.01$, $p<.05$). Supporting the diagnostic value of corporate names, we found that private companies with health or nutrition-related names made 2.1 "diet" claims per product on average vs. 1.1 claims for other private companies ($t=4.41$, $p<.01$). This effect holds even after adding the covariates used in Study 4. To rule out the possibility that this could happen because private American firms are more likely to have descriptive corporate names in general, we coded whether corporate name referred to nature (e.g., "Left Coast Naturals" or "Groupe Léa Nature"). Unlike for health or nutrition-related names, the proportion of private firms with a nature-related corporate name was similar in both countries (14.9% in the United States vs. 17.6% in France, ($\chi^2(1)=0.35$, $p=.55$), suggesting that American firms are not simply more likely to use descriptive corporate names. The list of company names is in Web Appendix 6. Although future research is necessary to rule out other potential confounds, these results suggest that the mismatch in the United States may be partially driven by the larger number of private American companies with a health or nutrition mission. If private US companies used the type of claim that match their customers'

preferences[2], their share of choice relative to public companies would increase by 2.14 percentage points, which is consequential given the size of the US breakfast cereal ($12.6 billion).

Implications for research

We found that public firms are more market oriented than smaller privately-owned firms in the market, the United States, where mismatching is less common. These results provide novel evidence for the positive relationship between market orientation and company ownership, as well as for the need to examine the moderating effects of country differences. Our finding that the degree of matching is higher in France than in the United States for public companies in general (and for Kellogg's and General Mills in particular) suggests that even dominant multinational companies adapt the degree to which they are customer-oriented depending on country characteristics. Future research is necessary to examine whether these results are driven by differences in demand, in the regulatory environment, or both. Additionally, future research should examine possible bi-directional effects, in which marketers' actions are both causes and consequences of consumer preferences.

Our research relies upon an objective measure of customer orientation, the degree of matching between the claims made by the company and those sought by consumers. In contrast, prior research has often used subjective measures of market orientation based on surveys of executives (Kohli, Jaworski and Kumar 1993). For example, marketers are asked to indicate

[2] Given that average claim preferences in the United States are 5.25, 5.15, 5.01 and 4.80 on the 1-7 "best choice for breakfast" scale for "enriched," "whole," "clean" and "diet" claims, respectively, an allocation of claim types according to their relative preferences would be 30%, 27%, 24%, and 19% when using a logit choice rule (vs. 9%, 25%, 31% and 35% currently, as can be derived from Table 5). Thus, preferences for the average SKU of private companies would increase from 4.99 (the weighted average given the current allocation of claim types) to 5.08 (the weighted average given the optimal allocation). Assuming that preferences for the average SKU of public companies (computed by the same method) remain constant at 5.09, the choice share of private (vs. public) companies, also estimated according to a logit choice rule would increase from 47.5% to 49.6%, a 2.14 percentage point improvement.

whether they "measure customer satisfaction" (Narver and Slater 1990). The selection of objective vs. subjective measures has been found to matter in the academic literature. Whereas market orientation is positively related to subjective measures of performance (Narver and Slater 1990; Song and Parry 2009; Zhou, Brown, Dev and Agarwal 2007), a large-scale meta-analysis of 355 effect sizes by Kirca, Jayachandran and Bearden (2005) found weaker results when using objective measures of performance, such as sales growth or ROI. Future research should therefore examine whether the results established with subjective measures of customer orientation also hold when using more objective measures.

Implications for food marketers

The goal of our research is not to make recommendations about marketing strategy but to examine the different ways food products claim to be healthy. This explains why we contrasted consumers' preferences for each type of claim with their frequency on product packages, not with the market share of brands with each type of claim. Indeed, examining market shares would not allow us to separate food marketers' actions and consumers' preferences because market shares are the consequence of both.

Still, our findings have implications for food marketers. First, they show that food companies cannot simply respond to the growing interest for health by improving the nutritional quality of their foods. They must first understand what it means for their consumers that a food is healthy and keep track of how these interpretations change, even when they do not align with nutrition. This was highlighted by the CEO of PepsiCo, Indra Nooyi, who said that "the consumer has turned the definition of healthy upside down. If it is non-GMO, natural or organic—but high in sodium and high in sugar and fat—it's okay" (Reingold 2015).

To further understand the factors that may impede market orientation in this category, we presented our results to senior marketing executives from the two market leaders. They provided consistent analyses. First, they mentioned that their companies did not consider food claims in a systematic way because they did not have a comprehensive conceptual framework to understand the multiple perceptions of food healthiness in the category. Second, they attributed the lower number of claims made by public producers and retailers to stronger legal and compliance oversight. Third, they were surprised at the high level of preference for cereals with "enriched" claims. In fact, the most highly rated claim by American respondents in terms of total preferences was "good source of calcium and vitamin D." The experts explained that breakfast cereals have always been enriched and are one of the few food categories with fortification claims, hence they assumed that consumers would know this and disregard any such claim as "old news." These comments underscore that food marketers must be careful not to project their own knowledge and preferences onto consumers (Herzog, Hattula and Dahl 2021).

One final implication of our results is that food marketers should not assume there is convergence between countries in their understanding of what constitutes healthy food. Although cross-national effects do exist, such as the growing interest for healthiness and for natural solutions, our results show persistent and stark differences between American and French preferences, even for a relatively new and international product category like breakfast cereals. Food marketers must therefore conduct thorough local market research when examining new markets, such as China. Cross-cultural research is particularly important to examine how food claims differ in terms of their expected functional, hedonic and symbolic benefits, not just in terms of overall preferences, and to examine their impact not just on purchases but on what, when, and how much people buy (Haws and Liu 2016; Liu et al. 2019).

Conflict of interest

The authors declare that they have no conflict of interest.

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Web Appendix

Healthy in the Wrong Way: Mismatching of Marketers' Food Claim Use and Consumers' Preferences in the United States but not in France

Contents

Web Appendix 1 – Additional Figures and Tables

Table A1 – List of Claims Studied

	Absence-focused claims	Presence-focused claims
Nature-based claims	**"Clean"** No Additives*/Preservatives*, Palm Oil Free, Hormone Free, No Added Sugar, GMO Free, Vegan/No Animal Ingredients, Vegetarian, no artificial flavor†, no artificial color†	**"Whole"** Wholegrain*, All-Natural Product*, Organic*, Wholesome†
Nutrition-based claims	**"Diet"** Diet/Light*, Toxins Free, Gluten Free, Dairy Free, Low/No/Reduced Allergen, Low/No/Reduced Calorie*, Low/No/Reduced Carb, Low/No/Reduced Cholesterol, Low/No/Reduced Fat*, Low/No/Reduced Glycemic, Low/No/Reduced Lactose, Low/No/Reduced Saturated Fat, Low/No/Reduced Sodium, Low/No/Reduced Trans-fat, Low/Reduced Sugar*, Sugar Free	**"Enriched"** Added Calcium*, Antioxidant*, High/Added Fiber*, High/Added Protein*, Prebiotic, Probiotic, Stanols/Sterols, Vitamin/Mineral Fortified.

Note: *: Claims present in both the Mintel data and in the consumer survey. †: Claims only present in the consumer survey.

Figure A1 - Study 1: Evolution of Claim Frequency by Country and Product Category

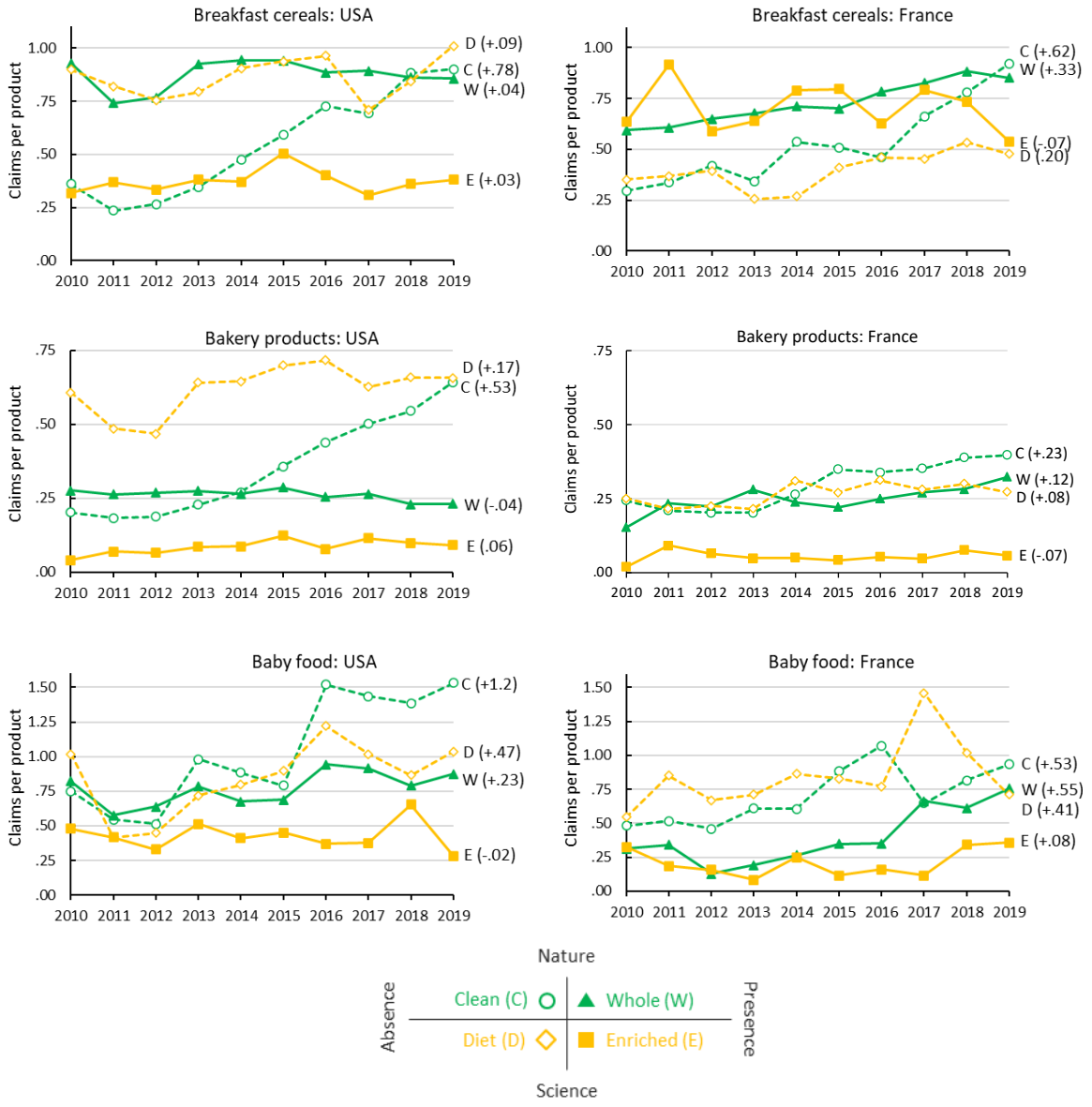

Figure A2 - Study 2: Detailed Results for Each Claim

					Preference	Functional benefits						Hedonic benefits			Symbolic benefits				
Country	Claim type			Claim	Best Choice	Healthier	High Quality	Satiating	Beauty	Value	Dieting	Tasty	Reward-ing	Boring	Hype	Child Food	Guy Food	Social Food	Girl Food
USA	Absence	Nature	Clean	No additives	5.3	5.4	5.3	4.3	4.7	4.5	4.3	4.5	4.4	3.1	3.4	3.5	3.8	4.4	4.2
				No artificial color	4.8	4.9	5.1	3.8	3.9	4.2	3.5	4.5	4.2	3.5	3.3	3.6	3.8	4.5	4.4
				No artificial flavor	5.0	4.9	5.2	4.1	4.2	4.7	4.1	4.9	4.7	3.4	3.6	3.9	4.0	4.6	4.5
				No preservatives	4.9	5.1	5.2	4.3	4.1	4.5	4.1	4.6	4.5	3.4	3.5	3.7	3.9	4.5	4.3
		Nutrition	Diet	Light	4.3	5.0	4.1	3.6	4.6	3.8	5.2	4.1	4.0	3.9	4.1	3.0	3.2	3.9	4.7
				Low calories	4.9	5.4	4.5	4.2	5.0	4.2	5.5	4.3	4.7	3.3	3.2	3.2	3.7	4.3	4.8
				Low fat	4.8	5.3	4.5	4.2	4.8	4.3	5.2	4.0	4.4	3.9	3.9	3.1	3.7	4.3	4.9
				Low sugar	5.2	5.6	4.7	4.5	4.8	4.4	5.1	4.2	4.5	3.6	3.3	3.4	4.0	4.5	4.7
	Presence	Nature	Whole	All natural	5.4	5.4	5.5	4.6	4.8	4.6	4.7	4.6	4.6	3.5	3.6	3.6	4.2	4.7	4.8
				Organic	4.6	5.4	5.2	4.2	4.1	4.1	4.3	4.3	4.1	3.4	3.7	3.1	3.7	4.2	4.3
				Whole grains first ingredient	5.4	5.6	5.4	5.4	5.0	4.6	5.0	5.0	4.6	3.0	2.9	3.5	4.1	4.6	4.7
				Wholesome	5.2	4.9	5.2	5.1	4.3	4.4	4.2	4.7	4.4	3.2	4.0	3.7	3.8	4.4	4.3
		Nutrition	Enriched	Good source of calcium and vitamin D	5.5	5.5	5.4	4.7	4.9	4.7	4.5	4.8	4.7	3.1	3.2	3.9	4.3	4.7	4.9
				High antioxidants	5.2	5.4	5.1	4.3	4.7	4.5	4.3	4.5	4.2	3.2	3.9	3.5	4.2	4.4	4.6
				High Fiber	5.0	5.5	5.1	5.2	4.7	4.5	4.9	4.5	4.1	3.6	3.1	3.2	4.4	4.1	4.5
				High proteins	5.3	5.5	5.3	5.6	4.6	4.4	4.6	4.4	4.3	3.1	3.2	3.4	4.8	4.3	4.2
France	Absence	Nature	Clean	No additives *(sans additifs)*	5.0	5.3	5.2	3.9	4.1	4.1	3.7	4.5	4.6	3.2	3.2	4.1	3.9	4.4	4.3
				No artificial color *(sans colorant artificiel)*	5.2	5.5	5.4	4.0	3.7	4.4	3.8	4.9	5.0	3.1	3.4	4.4	3.9	4.7	4.2
				No artificial flavor *(sans arômes artificiels)*	5.0	5.2	5.3	4.0	3.9	4.2	4.0	4.8	4.7	3.0	3.4	4.3	3.9	4.5	4.5
				No preservatives *(sans conservateurs)*	5.0	5.1	5.3	3.9	3.9	4.0	3.7	4.7	5.0	3.0	3.1	4.1	3.6	4.4	4.0
		Nutrition	Diet	Light *(allégées)*	4.6	5.0	4.6	3.9	4.1	3.8	4.9	4.5	4.5	3.3	4.0	3.8	3.5	4.1	4.8
				Low calories *(faible teneur en calories)*	5.1	5.3	4.7	4.2	4.2	4.0	5.1	4.8	4.9	3.4	3.5	4.0	3.7	4.2	5.0
				Low fat *(faible teneur en gras)*	4.9	5.1	4.9	4.0	4.1	4.1	4.9	4.4	4.8	3.2	3.5	4.1	4.0	4.4	4.7
				Low sugar *(faible teneur en sucre)*	5.0	5.3	4.8	4.2	4.1	4.1	5.1	4.4	4.7	3.4	3.3	4.1	3.8	4.4	4.7
	Presence	Nature	Whole	All natural *(naturelles)*	5.0	5.5	5.4	4.2	4.3	4.3	4.1	4.9	4.9	3.2	3.3	4.4	3.9	4.4	4.4
				Organic *(issues de l'agriculture biologique)*	5.2	5.4	5.4	4.4	4.1	4.0	3.9	5.0	4.8	3.1	3.3	4.2	4.0	4.6	4.5
				Whole grains first ingredient *(fabriquées avec des céréales complètes)*	5.2	5.4	5.3	5.0	4.0	4.2	4.4	4.9	4.8	2.9	3.0	4.3	3.9	4.4	4.4
				Wholesome *(complètes)*	5.2	5.4	5.2	5.2	4.2	4.1	4.4	4.7	4.7	3.0	3.3	4.0	3.9	4.3	4.1
		Nutrition	Enriched	Good source of calcium and vitamin D *(riches en calcium et vitamine D)*	5.0	5.2	5.1	4.1	4.2	4.3	3.5	4.7	4.7	3.1	3.7	4.5	3.9	4.3	4.3
				High antioxidants (riches en antioxidants)	4.7	5.2	4.7	3.8	4.3	3.9	3.9	4.3	4.4	3.1	3.4	3.9	3.7	4.1	4.4
				High Fiber *(riches en fibres)*	5.2	5.6	5.3	4.9	4.3	4.0	4.6	4.8	4.9	3.1	2.9	3.9	4.0	4.3	4.5
				High proteins *(riches en protéines)*	4.9	4.9	5.2	5.0	4.0	4.4	4.3	4.7	4.8	3.4	3.5	4.2	4.3	4.5	4.3

Web Appendix 2 - Study 2: Do individual characteristics explain the diverging preferences of American and French respondents?

Comparing American and French Respondents

We first explored whether the differences between American and French consumers can be explained by differences in individual characteristics. As mentioned in the text, the American and French samples were matched in terms of average age, gender, income, and education level. There was no attempt to match them on nutrition knowledge, BMI, or purchase frequency.

Subjective nutrition knowledge was measured by asking respondents to answer three questions ("How much do you think you personally know about nutrition?," "How much do you think you personally know about healthy eating?" and "How much do you think you personally know about disease prevention?") on a seven-point scale anchored at "much less than other people" and "much more than other people" (as in André, Chandon Haws 2019). American and French respondents claimed to be equally knowledgeable about nutrition (M_{US}=4.22 vs. M_{FR}=4.16, p=.49).

To measure objective nutrition knowledge, we used the test developed by Moorman, Diehl, Brinberg and Kidwell (2004), which asks respondents to match 10 nutrients with a corresponding health outcome (e.g., "calcium" and "builds strong bones") and assigned one point per correct answer. Objective nutrition knowledge was higher among American than French respondents (M_{US}=5.7 vs. M_{FR}=3.5, F(1,831)=108, p<.01). This is consistent with prior research which found that Americans were more knowledgeable than the French about nutrition (Fischler, Masson and Barlösius 2008).

To measure BMI, we asked respondents to report their weight and height (49 respondents (5.8%) failed to report both). As expected, American respondents had a higher average BMI than their French counterparts (M_{US}=28.6 vs. M_{FR}=25.5, F(1,782)=50, p<.01).

Finally, respondents were asked how often they purchased breakfast cereals. As pre-registered, those answering the first two categories, "never" (coded as 1) and "once a year or less" (coded as 2) were not allowed to continue the survey in both countries. There were no differences between the two countries in the distribution of answers to the other three categories: "several times a year" (coded as 3), "once a month" (coded as 4), and "several times a month" (coded as 5): $\chi^2(2)=4.05$, $p=.13$.

Can individual differences explain the different claim preferences of American and French respondents?

We first regressed claim rating on valence, naturalness, their interaction, and the eight measures of individual characteristics. As shown in Table A2, the effects on claim ratings of claim valence, naturalness, and their interaction were unchanged when incorporating all the individual sociodemographic characteristics as control variables (model 2) compared to the model without covariate (model 1). This was not surprising given that both samples were very comparable on all these characteristics, except for objective nutrition knowledge and BMI.

In another regression (model 3), we added an interaction between each of the eight individual characteristics and valence, naturalness, and their interaction. As can be seen in Table A2, only one of the 24 interactions was statistically significant: a positive interaction between valence and objective nutrition knowledge ($p<.01$). These interactions indicate that people with the general preference for presence-focused claims was even stronger among people with a high objective nutrition knowledge, and that women preferred nature-based claims (vs. nutrition-based claims) more than men. As predicted, the preference for nature-based claims was independent of objective nutrition knowledge ($p=.88$) and independent of subjective nutrition knowledge ($p=.19$), contrary to our registered prediction.

Overall, our analyses showed that only one of the eight sociodemographic, objective nutrition knowledge, differed between the two samples and significantly influenced preferences for one type of claims. This suggests that the stronger preference of Americans for presence-focused claims can be partially explained by their higher objective nutrition knowledge. However, this was only a partial mediation since the effects of presence focus on claim rating continued to be statistically significant. Other than that, the diverging preferences for each type of claim between America and French respondents cannot be attributed to sociodemographic, BMI, or purchase frequency differences.

Table A2 - Study 2: Effect of Individual Characteristics in Predicting Claim Preferences

	Model 1 (N=3,332)			Model 2 (N=3,128)			Model 3 (N=3,128)		
	Coef.	*Z*	*p*	*Coef.*	*z*	*p*	*Coef.*	*z*	*p*
Presence	.11	4.54	.00	.11	4.30	.00	.10	4.22	.00
Nature	.09	2.87	.00	.08	3.17	.00	.07	3.15	.00
Presence × Nature	-.07	-1.48	.14	-.07	-1.55	.12	-.07	-1.45	.15
Age				.00	.09	.93	.00	.09	.93
Female				.15	2.62	.01	.15	2.62	.01
Education				-.01	-.42	.68	-.01	-.42	.68
Income				.03	1.77	.08	.03	1.77	.08
Subj. Know.				.14	5.76	.00	.14	5.76	.00
Obj. Know.				-.01	-.14	.89	-.01	-.14	.89
BMI				.00	.00	.99	.00	.00	.99
Purch. Freq.				.10	2.93	.00	.10	2.93	.00
Age × Presence							.00	-.03	.97
Age × Nature							.00	-1.55	.12
Age × Presence × Nature							.00	-.29	.77
Female × Presence							.07	1.25	.21
Female × Nature							.10	1.90	.06
Female × Presence × Nature							-.15	-1.46	.15
Education × Presence							-.01	-.58	.56
Education × Nature							-.01	-.41	.68
Education × Presence × Nature							.01	.28	.78
Income × Presence							.00	.08	.93
Income × Nature							.01	.83	.41
Income × Presence × Nature							.03	.82	.41
Subj. Know. × Presence							-.01	-.23	.82
Subj. Know. × Nature							.01	.65	.52
Subj. Know. × Presence × Nature							.04	.87	.39
Obj. Know. × Presence							.02	2.60	.01
Obj. Know. × Nature							.01	1.11	.27
Obj. Know. × Presence × Nature							-.01	-.74	.46
BMI × Presence							-.01	-1.27	.20
BMI × Nature							-.01	-1.80	.07
BMI × Presence × Nature							.00	-.42	.68
Purch. Freq. × Presence							.02	.71	.48
Purch. Freq. × Nature							-.05	-1.65	.10
Purch. Freq. × Presence × Nature							-.01	-.11	.91

Web Appendix 3 - Study 2: Does nutrition knowledge explain benefit importance and rating?

We first examined whether subjective and objective nutrition knowledge influenced the importance of the 14 benefits of claims in driving overall claim evaluation (left panel of Figure 5). To achieve this goal, we regressed claim rating on each of the perceived claim benefit, subjective knowledge, objective knowledge, their interaction with the claim benefit, as well as the valence and naturalness (and their interaction) as control variables. As can be seen in Table A3, the main effect of subjective knowledge was not statistically significant, as were 13 of the 14 interactions. The only statistically significant interaction involving subjective nutrition knowledge was with the perception that the claim was not boring. In contrast, objective nutrition knowledge increased claim rating and increased the importance of the inference that the food was healthy, satiating, and dieting compatible. Finally, Table A3 shows that the coefficients of presence, nature, and their interactions are no longer statistically significant once the 14 benefits are included in the regression, which suggests that the effects of the valence and naturalness of the claim are fully mediated by the benefit inferences.

Overall, these analyses show that subjective nutrition knowledge increased the importance of food novelty (not boring) in driving claim rating, whereas objective nutrition knowledge increased the importance of inferences about the healthiness, satiating, and dieting-compatible properties of the food.

Table A3 — Study 2: Interactions of Nutrition Knowledge with Claim Benefits in Predicting Claim Preferences

	Model 1			Model 2		
	Coef.	*z*	*p*	*Coef.*	*z*	*p*
Healthier	.26	16.47	.00	.27	16.51	.00
High Quality	.17	10.45	.00	.17	10.01	.00
Satiating	.03	2.19	.03	.03	1.96	.05
Beauty	.09	5.14	.00	.09	5.28	.00
Value	-.01	-.67	.50	-.01	-.31	.75
Dieting	.00	.24	.81	.01	.33	.74
Tasty	.12	6.64	.00	.11	6.49	.00
Rewarding	.12	7.61	.00	.12	7.72	.00
Not Boring	.08	5.62	.00	.07	5.17	.00
Not Hype	.07	5.23	.00	.07	4.97	.00
Child Food	.09	5.63	.00	.11	6.30	.00
Guy Food	-.03	-1.86	.06	-.03	-1.99	.05
Social Food	.08	4.71	.00	.08	4.58	.00
Girl Food	.05	3.06	.00	.04	2.71	.01
Subj. Know				.00	.22	.83
Subj. Know × Healthier				.02	1.93	.05
Subj. Know × High Quality				.02	1.52	.13
Subj. Know × Satiating				-.02	-1.56	.12
Subj. Know × Beauty				-.02	-1.64	.10
Subj. Know × Value				.00	-.32	.75
Subj. Know × Dieting				.01	1.17	.24
Subj. Know × Tasty				-.01	-.82	.41
Subj. Know × Rewarding				-.01	-.66	.51
Subj. Know × Not Boring				-.03	-3.28	.00
Subj. Know × Not Hype				.01	.83	.41
Subj. Know × Child Food				-.01	-1.00	.32
Subj. Know × Guy Food				-.01	-1.14	.26
Subj. Know × Social Food				.00	-.15	.88
Subj. Know × Girl Food				.01	.43	.67
Obj. Know				.02	3.49	.00
Obj. Know × Healthier				.01	2.65	.01
Obj. Know × High Quality				.00	.81	.42
Obj. Know × Satiating				.01	2.10	.04
Obj. Know × Beauty				-.01	-1.47	.14
Obj. Know × Value				.00	.04	.97
Obj. Know × Dieting				-.01	-2.56	.01
Obj. Know × Tasty				-.01	-1.58	.11
Obj. Know × Rewarding				.00	.51	.61
Obj. Know × Not Boring				.00	-.34	.73
Obj. Know × Not Hype				.01	1.41	.16
Obj. Know × Child Food				.00	.05	.96
Obj. Know × Guy Food				.00	.04	.97
Obj. Know × Social Food				.00	.62	.54
Obj. Know × Girl Food				.01	1.02	.31
Presence	.01	.62	.54	.01	.48	.63
Nature	.00	-.06	.95	.00	-.23	.82
Presence × Nature	-.02	-.43	.67	.00	-.01	.99

Note: Errors are clustered at the country and individual levels for all regressions.

In a second analysis we examined whether subjective and objective nutrition knowledge influenced the perceived benefits of the breakfast cereals bearing each type of claim (center and right panels in Figure 5). We conducted 14 separate regressions of each benefit rating on subjective and objective nutrition knowledge, a four-level variable capturing claim cluster, and the two-way interactions. As Table A4 shows, the main effect of subjective nutrition knowledge was statistically significant for all 14 benefit inferences, whereas the main effect of objective nutrition knowledge was statistically significant for 12 of the 14 benefits. More importantly, none of the interactions involving subjective nutrition knowledge was statistically significant. In contrast, objective knowledge significantly interacted with claim type to influence four inferences (about the perceived quality, satiating properties, dieting properties, and taste of the food).

Overall, these analyses show that people with various levels of subjective nutrition knowledge make the same inferences about foods bearing each type of claim. This is also generally the case for objective nutrition knowledge, which did not influence 10 of the 14 inferences and had no systematic pattern of effects on the remaining four inferences. For example, objective nutrition knowledge positively interacted with naturalness for inferences about the quality of the food but interacted negatively with naturalness for inferences about its taste.

In conclusion, neither subjective nor objective nutrition knowledge plays an important role in influencing the ratings of the 14 inferences across the four types of claims, nor do they systematically impact how these ratings drive claim preferences.

Table A4 - Study 2: Effects of Nutrition Knowledge and Claim Type on Benefit Ratings

Dependent variable	Claim type		Subjective knowledge		Subj. know. × claim type		Objective knowledge		Obj. know. × claim type	
	$F_{3,3320}$	p	$F_{1,3320}$	p	$F_{3,3320}$	p	$F_{1,3320}$	p	$F_{3,3320}$	p
Healthier	1.36	.25	113.6	.00	1.15	.33	2.36	.12	1.62	.18
High Quality	1.16	.32	160.7	.00	.62	.60	7.78	.01	8.86	.00
Satiating	.49	.69	99.9	.00	.29	.84	23.17	.00	4.24	.01
Beauty	1.20	.31	142.9	.00	1.04	.37	7.23	.01	1.81	.14
Value	.33	.81	184.7	.00	.21	.89	60.64	.00	.34	.80
Dieting	3.08	.03	70.7	.00	.79	.50	8.05	.00	11.40	.00
Tasty	.36	.78	183.0	.00	.46	.71	114.2	.00	2.77	.04
Rewarding	.44	.73	144.0	.00	.55	.65	67.44	.00	.99	.40
Not Boring	.88	.45	11.0	.00	.86	.46	9.39	.00	2.19	.09
Not Hype	.38	.77	38.5	.00	.64	.59	4.98	.03	1.67	.17
Child Food	.43	.73	147.2	.00	.63	.60	276.4	.00	2.56	.05
Guy Food	.63	.59	145.8	.00	.39	.76	31.66	.00	1.73	.16
Social Food	.30	.83	161.0	.00	.24	.87	87.30	.00	.78	.50
Girl Food	1.77	.15	113.2	.00	1.08	.36	1.23	.27	2.13	.09

Web Appendix 4 - Study 2: Consumer Heterogeneity in Claim Ratings

To examine heterogeneity in overall claim ratings, we performed a hierarchical cluster analysis using ward's linkage method. We determined clusters at the country level, using the four claim preferences as dependent variables. In both countries the dendrogram indicated two main clusters. As illustrated in Table A5, we reported the means of top choice as well as mean demographic variables by cluster.

We identify two clusters: the "majority" (USA: N = 261, France: N = 272) and the "anti-claim" group (USA: N = 152, France: N = 148). The demographic pattern is very similar across the two countries, although not all demographic differences are significant in both countries. The "majority" (vs. "anti-claim) scored significantly higher in subjective nutritional knowledge for both countries. In France, the "majority" (vs. "anti-claim) scored significantly higher in objective nutritional knowledge, proportion of women, education, and cereal purchase frequency. In the US, the "majority" (vs. "anti-claim) scored higher on income.

Next, we examined the effect of cluster on claim preferences as well as on the matching with marketers claim use. First, we found that all claim preferences were significantly higher (p_s<.001) in the majority (vs. anti-claim). Second, we found that the pattern of claim preference in the "majority" cluster led to higher correlation with the marketers' claim use than in the "anti-claim" cluster (USA: -.37 vs. -.99, France: .87 vs. .11). These results provide tentative evidence of heterogeneity in matching consumer's claim preferences with marketers' claim use. We invite further research to account for heterogeneity at the customer-level (e.g., consumer characteristics) and marketer-level (e.g., different product characteristics).

Table A5 - Study 2: Cluster Analysis

	USA			France		
	All	Cluster 1 "majority"	Cluster 2 "anti-claim"	All	Cluster 1 "majority"	Cluster 2 "anti-claim"
N		261	152		272	148
Mean claim rating						
Clean	5.15	5.79	3.66**	5.05	5.93	3.43**
Diet	5.01	5.45	3.68**	4.91	5.54	3.75**
Whole	5.25	6.03	3.63**	5.15	5.91	3.76**
Enriched	4.80	5.97	4.01**	4.94	5.81	3.33**
Match with frequency						
Correlation	-0.65	-0.37	-0.99	0.98	0.87	0.11
Mean demographics						
Subjective knowledge	4.22	4.48	3.77**	4.16	4.33	3.86**
Objective knowledge	5.66	5.73	5.55	3.50	3.86	2.84**
Age	41.09	40.52	41.99	41.52	41.86	40.90
Gender (% female)	0.56	0.57	0.53	0.54	0.59	0.46*
Education	2.81	2.87	2.72	2.70	2.82	2.5*
Income	3.08	3.17	2.70**	3.25	3.11	2.77
BMI	28.59	28.49	28.76	25.53	25.53	25.52
Cereal Buying Frequency	4.30	3.28	4.23	4.19	4.26	4.06*

Note: Mean statistically different from the mean of the other cluster in the same country at the 0.01 level (**) or at the 0.05 level (*).

Web Appendix 5 - Study 4: Matching by Company Size

To examine the level of matching by companies of different sizes, we obtained company-level market share data from Euromonitor (www.euromonitor.com/packaged-food) for the 2017-2019 period. In both countries, Kellogg's and General Mills (via its joint venture with Nestlé in France) are the clear market leaders, accounting for 54% of the market in retail value in the United States (equally split between the two companies) and 59% of the market in France (38% for Kellogg's and 21% for General Mills). Euromonitor provided market share information for all the other producers with a market share above 0.2%, a total of six companies in the United States and six others in France. These other large producers, who are listed in the notes for Table A6, accounted for 35% of the market in the United States and 15% in France. Euromonitor does not provide market share information for each retailer but estimates that private labels account for 9% of the market in the United States and 12% in France. We identified the five largest retailers in the United States and in France by food revenues and grouped them into another category (the names of these retailers are listed in the notes of Table A6). All the other SKUs were categorized as belonging to small companies. In the United States, we counted 154 small companies, which account for 2% of the market in retail value but 51% of the SKUs. In France, there are 102 small companies, which account for 14% of the market and 53% of the SKUs. As expected, there is a strong association between company size and ownership. 96.3% of private companies were classified as small vs. only 27.3% of public companies ($\chi^2(1)=111$, $p<.01$).

Just as in the regressions reported in the paper, we conducted a series of logistic regressions with matching as the dependent variable. We used dummy-coded binary variables for each company type (using small companies as the reference level) as the independent variables. The control variables were identical as those reported in the paper. The parameters of the regressions

are available in Table A6. Because of missing values (54 SKUs in the United States and 4 in France), the number of observations was 1,270 in the United States and 518 in France.

Table A6 - Study 4: Logistic Regression Parameters

	United States			France		
	Coef.	*z*	*p*	*Coef.*	*z*	*p*
Company factors (reference = small companies)						
Top 2 producers	.54	3.21	.01	.11	.43	.66
Other large producers	.58	3.41	.01	.62	1.80	.07
Large retailers	.94	3.78	.00	-.36	-1.15	.25
Covariates						
Cold cereals	-.22	-1.29	.20	-.08	-.17	.86
Standardized package size	.04	.39	.70	.40	3.05	.00
Standardized price	.13	1.44	.15	.23	1.71	.09
Standardized carbs	.22	3.51	.00	.41	4.03	.00
Log # of SKUs per brand	.02	.39	.70	.19	1.52	.13
Intercept	-1.41	-7.03	.00	-.46	-.90	.33

Note: The top two producers are Kellogg's and General Mills (via the Cereal Partners joint venture with Nestlé in France). The other large producers are, in alphabetical order: B & G Foods Inc, Bob's Red Mill Natural Foods, Kind LLC, Nature's Path Foods Inc, PepsiCo Inc, and Post Holdings Inc (United States) and Associated British Foods Plc, Groupe Léa Nature, Koninklijke Wessanen NV, PepsiCo Inc, Post Holdings Inc, Triballat-Noyal SAS (France). The large retailers are, in alphabetical order: Costco, CVS, Kroger, Walgreens, and Walmart (United States) and Auchan, Carrefour, E. Leclerc, Intermarché, and Système U (France).

Table A6 shows that in the United States, the coefficients of the company dummies were all positive and statistically significant, as expected. This indicates that the likelihood of a match was higher if the SKU belonged to one of the two market leaders, to another large producer, or to a large retailer, than if it belonged to a small producer. As shown in Table A7, only 23.4% of the SKUs belonging to small American producers matched consumers' preferences, whereas the corresponding proportion ranged between 34.1% and 44.7% for larger companies. In France, however, none of the parameters about company size were statistically significant, indicating that matching was similar for all types of companies, as can be seen in Table A7. The coefficients of the control variables were similar than in the analyses reported in the paper except that the coefficient for the price of the SKU was no longer statistically significant.

As in the main analysis, the difference between small and large companies was stronger in the United States than in France (β=-.47, Z=-2.10, p=.036). Similarly, the correlation between claim preferences and average claim frequency is more negative among smaller companies (r=-0.88) than among larger companies (r=-0.14) in the United States. In France, it is positive for both smaller (r=0.66) and larger companies (r=0.52). Further contrast tests showed a lower degree of matching for smaller companies than for the three other groups of companies (combined) in the United States (β=-.61, Z=-4.48, p<.001) but not in France (β=-.11, Z=-.55, p=.58). All the comparisons between smaller companies and larger companies yielded the same conclusions with and without covariates.

Table A7 - Study 4: Matching Likelihood and Number of Claims by Company Size

Category	# SKUs (%)	Matching (%)	Number of claims per SKU (2017-2019)				
			Clean	Diet	Whole	Enriched	Total
USA							
Top 2 producers	293 (22%)	34.1%	0.50	0.42	0.91	0.29	2.12
Other large producers	257 (19%)	35.4%	0.92	0.86	1.01	0.39	3.18
Large retailers	103 (8%)	44.7%	0.62	0.24	0.68	0.31	1.85
Small companies	671 (51%)	23.4%	1.01	1.14	0.86	0.36	3.37
France							
Top 2 producers	111 (20%)	46.8%	1.14	0.11	0.67	1.28	3.19
Other large producers	53 (10%)	66.0%	1.57	0.66	1.17	0.47	3.87
Large retailers	94 (17%)	31.0%	0.12	0.18	0.50	0.34	1.13
Small companies	294 (53%)	46.9%	0.73	0.82	0.99	0.49	3.03

Table A7 shows that the mismatching among smaller American companies is mostly driven by the very high number of claims about ‘diet’ (1.14 per product on average vs. 0.56 for larger companies), which was the least preferred type of claim by consumers. Table A7 also shows that claims about ‘enriched’, despite their appeal among American consumers, remain rare for all types of firms.

Overall. these analyses provide converging evidence to support the analyses of company ownership reported in the main paper. They show that the higher level of mismatching in the United States is driven in part by the decisions of small American companies who make many claims about 'diet', even though these are the least preferred by consumers. In comparison, all types of firms make roughly the same kinds of claims in France, and their claims generally match consumers' preferences more closely than in the United States. The mismatching by smaller US firms cannot be explained by a slowness to adapt to consumer preferences, since these firms have maintained a high frequency of 'diet' claims throughout the past 10 years (data not shown). Rather, they suggest a significant and persistent difference in claim usage between small and large cereal companies.

We also observe that large retailers make fewer claims than other types of firms in both countries, and yet have the highest matching rate of all in the United States. This cannot be explained by differences in the price, size, carbohydrate content or by the breadth of private label brands compared to other brands (as measured by the number of SKU variants) since these factors are controlled for in the analysis. These analyses further suggests that matching can be achieved even without making many claims if companies make the right kind of claims. Finally, they show that matching is more prevalent for breakfast cereals with more carbohydrates that make fewer 'diet' claims. In fact, most of the variation in matching comes from 'diet' claims. Claims about 'enriched', though the most preferred, are uniformly rare in the United States.

Finally, we conducted the same analysis of corporate names reported in the text but for smaller companies. We found that 15 of the 145 small firms operating in the United States (10.3%) had a corporate name related to health or nutrition, such as "Low Karb." In contrast, only 3 of the 93 private firms operating in France (3.2%) had a name related to health or nutrition (e.g., "ABCD Nutrition"), a statistically significant difference ($\chi^2(1)= 4.11$, $p<.05$).

Web Appendix 6 - Study 4: Classification of Corporate Names of Private Companies

	Related to health or nutrition	Related to nature
United States	Appetite For Healthy Living	Ancient Harvest
	Dr. McDougall's Right Foods	Back to Nature
	Engine 2 For Life	Back to the Roots
	Erin Baker's Wholesome	Bear Naked
	Baked Goods	Bob's Red Mill Natural Foods
	Glutenfreeda Foods	Earnest Eats
	GluteNull	Earth Fare
	Low Karb	From The Fields'
	Paleo Hero	Jessica's Natural Foods
	Paleo Passion Foods	Left Coast Naturals
	The Safe + Fair Food	Mountain Muesli
	thinkThin	Natural Direct
	Vigilant Eats	Nature's Path Foods
	WonderSlim	New England Natural Bakers
	Weight Watchers International	One Degree Organic Foods
		Organic Milling
		Riverside Natural Foods
		Small Batch Organics
		Summit Naturals
		Terra Breads
		Two Moms In The Raw
		Whole Foods Market
France	ABCD Nutrition	Barnhouse Naturprodukte
	Régime Dukan	Bio-Familia
	Zen & Sans Gluten	Biocoop
		Biodyne
		Biothentic
		Biscru
		Bob's Red Mill Natural Foods
		Botanic
		Eat Natural
		Groupe Léa Nature
		Happy Bio
		Le Club Bio
		Nature's Path Foods
		NaturéO
		Supernature
		Terres et Céréales
		Vita+ Naturprodukte
		Vitagermine

Note: Does not include spelling variations (e.g., “Weight Watchers” as “WW”). N=148 private companies in the United States and N=100 private companies in France.