Positioning GM Food Product : Benefits, risk and loss aversion considerations

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Abstract

Labeling of genetically modified (GM) food products in the EU is considered to be the reason for the decline in the export of soybeans from the US to the EU. Debate about content labeling (free of GM ingredients/contains GM material) is an example of the importance attributed to labeling formats that affect choice. Labeling regulations currently act as an active import barrier to US export of potatoes, corn, and soybeans among other products. However, labeling of GM products can also be used to inform consumers about product benefits and could increase GM food acceptance rather than blocking it. In this study, we analyze the effectiveness of four different positioning tactics in inducing adoption using four new types of GM potatoes that vary in their benefits: improved taste; high-temperature, which reduces the risk of cancer; low-calorie that reduces the risk of diabetes and cardiovascular diseases; and antioxidant varieties, comparing them with traditionally grown potatoes.

While it has been shown that consumers are willing to pay a price premium for genetically modified (GM) food products if such products are designed to enhance wellbeing, information on biotechnology's capacity to reduce health risks is likely to reduce the acceptance rate. It is argued that information on lower risk may actually increase consumers' accessibility to health hazards increasing the likelihood of rejecting upfront the new technology despite its advantages.

Our results indicate that given the right positioning, the majority of consumers are willing to purchase GM foods that either reduce risk or increase benefits. While the acceptance of GM food was higher when the benefit was better taste, and lowest when it primed lower hazard of illness, more than 65% of consumers were willing to pay a price premium even for the less desirable positioning. Results and managerial implications are discussed,

Introduction

Suppose that marketing of genetically modified food (GM) products is legalized under the condition that they be labeled in a clear and noticeable way. The requirement of labeling that a product is GM does not exclude the option to use that label also as a source of positioning that may increase the value of the product.

Previous studies suggest that many consumers are willing to pay a premium price for GM food products that have the capacity to enhance their wellbeing by adding nutritional ingredients that contribute to health (Colson & Huffman, 2011). Positioning such products as a functional food, i.e., a food that promotes health or reduces risk of illness, is a strategy that is consistent with the recommendation to position it as a "medical application" (Siegrist, 2000), and is therefore a logical choice.

Along these lines, since GM products require lower usage of pesticides, they reduce health risks (Hamilton, Sunding, & Zilberman, 2003; Phipps & Park, 2002) and are thus expected to be preferred over conventionally grown agricultural products. Priming "less is more," i.e., the added benefit does not result from having more (ingredients), but less (pesticide), in practice, positions the product based on its risk reduction capacity. This strategy is expected to increase adoption relative to functional food positioning tactics when considering the prospect theory (Tversky & Kahneman, 1974) and loss aversion models (Gul, 1991; Rabin, 2000). These models suggest that consumers give higher value to loss relative to equivalent gain, and therefore, a reduction in the likelihood of illness (loss of wellbeing) is expected to be valued more than a gain resulting from consuming functional food (added wellbeing). However, it has been found that consumers object to GM food products when they are positioned to have lower pesticide levels (Chern, Rickertsen, Tsuboi, & Fu, 2002; Huffman, 2010; Krishna & Qaim, 2008). Consumers' reluctance to purchase GM fruits and vegetables that are positioned as safer and less harmful is even more puzzling given the trendiness of organic crops that are sold using the same argument of being commercial pesticide-free even though studies have not found strong scientific evidence that organic vegetables and fruits actually have better quality nutrients or are safer (Bourn & Prescott, 2002).

The objection of many consumers to the idea of consuming GM products despite information on their lower level of pesticide usage, which is expected to decrease consumers reluctance to GM food may result from consumers low trust in this sort of information (i.e., GM supports helps rather than being hazardous) or the outcome of consumers' increased accessibility to risk after becoming aware of health hazards resulting from consumption (Biehal & Chakravarti, 1983; Dick, Chakravarti, & Biehal, 1990; Menon, Block, & Ramanathan, 2002; Weber & Johnson, 2005). The explanation may be an oversimplification of consumer choices under uncertainty, but it is not in line with Monsanto's campaign for its Roundup Ready varieties (Charry, 1997; Hall, 1999). One aim of this paper is to analyze which positioning strategy is preferred in the context of GM vegetables and fruits: as functional food (i.e., added nutrients) or being less risky (less pesticide). This empirical analysis leads to a more fundamental theoretical problem: Does choice that involves increased health hazards that can be avoided result in excluding the riskier product from the choice set (there is no tradeoff between risk and benefits)? Or alternatively, under some conditions, do consumers consider the tradeoff between benefits and risk?

The tradeoff between health hazards and benefits of improved wellbeing depends on the perception of risk (size) and benefit. In some cases, health risk is likely to outweigh the benefits of a product, while in other cases, consumers prefer to accept a small risk for the benefit of increased wellbeing or other benefits such as higher income or higher social acceptability (Evans & Viscusi, 1991; Viscusi, 1993; Viscusi, Magat, & Huber, 1987). While previous studies analysed the tradeoff between benefit and risk using choices such as lotteries or have calculated the cost of risk using a revealed preference approach (e.g., riskier occupation, housing near or far from highways), this study focused on choices when the benefit may be tangible or intangible, while the risk is ambiguous. Using this research design enabled us to capture the choice environment where risk of GM consumption is a matter of belief rather than of scientific proof.

Using an experimental survey method, we explored consumers' willingness to purchase a GM product (potatoes) that is produced to provide either a lower health risk, better taste, antioxidant content, or the same taste with fewer calories.

2. Information on health hazards and effect on choice

Information about health hazards that are related to the consumption of a product are likely to increase the association between risk and that product (Pennings, Wansink, & Meulenberg, 2002). Higher perception of a health risk reduces the value of the product, and therefore information that increases the perception of risk can be modeled as a "taste shifter" (Theil, 1965) or price deflator (Duffy, 1987), resulting in an increased likelihood of purchasing the "safer" alternative. This association, between risk and consumption, reduces the value of the product, and consequently the demand (Mazzocchi, 2006; Piggott & Marsh, 2004). Since subjective perception of risk increases with the ease of recall of hazardous events (Kahneman & Tversky, 1973), priming risk increases the accessibility, resulting in an increased likelihood of avoiding the hazardous behavior (Rothman & Kiviniemi, 1999). Increased awareness of risk may therefore increase willingness to avoid hazardous behavior and to adopt preventive measures (Raghubir & Menon, 1998). These measures include among others inclusion of a product believed to lower risk in the choice set. Therefore, these studies suggest that using the argument of lower risk coupled with higher accessibility is likely to increase the demand for a product that has the capacity to reduce risk.

Two other lines of research suggest that priming risk may have its drawbacks. The effect of information on perceptions and a choice process that is based on the combined production and information approach has been estimated in (Heiman & Lowengart, 2008, 2011), who showed that the importance weight of health attributes increases after exposure to information on risk, while the importance weights of other attributes depends on cross-information effects. Thus, priming risk coupled with information about a product's potential to reduce health hazards decreases the importance weight of health on the one hand, and increases the perception of the product's contribution to health on the other hand. These two effects may offset each other or increase (decrease) demand for the product depending on the magnitude of the change.

Secondly, priming risk may frighten the consumer. Although frightening is widely used in campaigns that aim to educate individuals to adopt more cautious behavior, fright may in fact operate a defense mechanism that renders a message ineffective. A fear-generating message initiates two mechanisms that affect individuals' responses in opposing ways (Witte & Allen, 2000): first, through a mechanism that aims to reduce aroused fear by establishing a

psychological defense mechanism that discounts or opposes the threatening message. Conversely, rational considerations may take over the fear response that is associated with autonomous response when the information is strong, relevant, and convincing (Slovic, Finucane, Peters, & MacGregor, 2004; Slovic, Peters, Finucane, & MacGregor, 2005; Thaler & Sunstein, 2008). Since these forces affect consumers in opposing ways, the response function to fear is expected to be characterized by an inverse U-shape relative to the level of the fear.

Summary

Estimating the effectiveness of health risk reduction messages on choices is not new to the literature, but its application to GM labeling has not yet been well studied. Many of the previous studies estimated the effect of denial, safety, and compliance with crisis management principles, but much less is known about the relative power of loss aversion relative to higher accessibility in affecting choices.

3. Empirical Study

3.1 Methodology

We analyzed the differences in acceptance between four different positioning tactics: added nutrients that support wellbeing and reduce risks of illness (i.e., antioxidant), less is more (lower pesticide = lower risk) positioning, better taste, and lower calories using experimental survey methodology.

3.1.1 Data collection and questionnaire

Our research assistants interviewed respondents using the face-to-face approach, chosen to allow for better control. Consumers were randomly approached on a campus of the largest university in Israel and in two cities in central Israel. This questionnaire was handed out to 300 consumers who were asked to fill it out and return it to the research administrator. The detailed form is presented in Appendix A.

3.1.2 Products

The tasty potato is a product of genetic manipulation (GM) yielding a better tasting potato. The antioxidant potato is a GM potato in which the gene responsible for producing antioxidants was manipulated in order to produce higher antioxidant levels. The high-temperature potato is genetically modified with the property that it can be fried at a temperature that is lower than the frying temperature that is believed to change the molecular structure of carbohydrates, which causes an increase in the risk of cancer. The fourth product is a low-calorie potato in which the genetic structure was changed to produce a low-calorie product without affecting taste.

3.1.3 *Questionnaire and data collection*

The questionnaire contained 30 questions. The first four measured consumers' perceptions on the health and taste attributes of conventional and the GM product. Measurement of perception was followed by a choice task between the conventional and GM products given 11 pairs of prices. Consumers had to choose one out of the 11 pairs that would cause them to change their initial selection from conventional to the GM alternative. In this choice task, consumers had the option to answer whether or not they preferred the GM or the conventional food product. "If you choose not to switch between the GM or the conventional potato, please indicate which one you choose (GM/conventional). Circle one." Perceptions about taste and health were collected using a 7-point Likert-style scale. For example "Eating the genetically engineered antioxidant potato will: 1—Increase health risk ….4—Not affect health …7—Contribute to health." The same procedure was used to measure perceptions and choice between conventional potatoes and the tastier, antioxidant, high-temperature, and low-calorie ones. Following these tasks, consumers were asked to refer to eight statements that measured attitude toward risk and to provide information according to several sociodemographic indicators. At the end of the questionnaire, respondents were asked to specify their gender, income, education, and field of studies (if they had an academic degree).

Since the risk factors are likely to be correlated, a factor analysis procedure was then employed to reduce heteroscedasticity. Results are presented at the next sub-section.

3.1.4 Risk factors

We extracted three factors explaining 53.4% of the variance of risk behaviors and attitudes (Factor 1: 19.6%; Factor 2: 18.7%; Factor 3: 15%). The first factor, termed the *risk avoider*, is

characterized by the choice of a balanced (hedged) risk portfolio and avoiding risky (extreme) sports or behaviors. The second factor, termed the *impulsive individual*, is characterized by adopting risky behaviors such as not wearing seatbelts and having a greater tendency toward making implosive investments. The third factor, termed the *careless individual*, is characterized by ignoring food labels and eating fast and processed foods.

4. Results

4.1 Willingness to purchase and switching prices

4.1.1 Segmentation

Based on their choices, consumers were assigned into one of the four segments: those who preferred the GM product regardless of price differences between GM and conventional products; switchers between GM and conventional (price-sensitive) products; non-GM buyers who were insensitive to changes in the price of the GM (conventional) products; and double switchers. Double switchers are those consumers who shifted from conventionally grown to GM potatoes when the latter's price dropped, and switched back when the price of the GM product continued to decline relative to the conventional variety. Table (1) presents the distribution of consumers between these four segments across the four products.

Table 1: Segmentation of consumers across the four types of potatoes

	Tasty	Antioxidant	High-temperature	Low-calorie
GM only	14.3%	14.3%	10%	26%
Switcher (conventional to GM)	75%	73%	63%	62%
Conventional only	5%	8.64%	23%	9%
Double switcher	5.7%	4%	4%	3%

Table 1 suggests that when a GM product is designed and positioned to enhance a product's benefits either by enhancing health or by reducing risk, then most consumers are willing to purchase it. When the benefit was lower calories, more consumers chose the GM alternative at the baseline situation in which prices of the GM potato were higher by 50% than those of the conventional product. The benefit consuming fewer calories (low-calorie) attracted 26.3% of

consumers who preferred the GM product relative to 14.3% in the case of tasty and antioxidant potatoes and 10% in the case of high-temperature potato. When the price of the GM product dropped, more consumers switched from the conventional option to the GM alternative. Close to a quarter of the consumers were not willing to purchase the high-temperature potatoes even when they were sold at a price discount of 50% lower than conventional potatoes. In contrast, more than a quarter of the consumers preferred the GM low-calorie potato. The distribution of consumers between the four segments was similar across tasty and antioxidant varieties, while it differed in the case of high-temperature and low-calorie products. When the GM potato added benefits not associated with health hazards, only a slim proportion of the respondents (5%–9%) refused to purchase the taste, antioxidant, and low-calorie potatoes. In the case of high-temperature GM potatoes, which offer the most in terms of health hazard reduction, the proportion of consumers who resisted the idea of buying GM tripled, reaching 22.6%, while the proportion of buyers who chose the GM product regardless of price was about 10%. The willingness to purchase the low-calorie GM potato was nearly a mirror image of the choice pattern of the high-temperature GM potato. The proportion of consumers who chose the GM potatoes that were not related to risk was between threefold to twofold, relative to the high-temperature potato. This finding suggests that risk reduction is less powerful than the effect of higher accessibility to risk. This is of course a paradox since when risk was primed, the likelihood that a consumer would consider purchasing GM products designed to reduce health hazards was lower, while it was expected to be higher. Thus, we obtain support for the argument that priming risk may actually counterbalance the benefits of risk reduction.

4.1.2 Willingness to pay for GM products

We calculated the average switching price in the second segment of consumers who preferred the conventional potato when the GM alternative was higher by 50%, and who switched to the GM product when its price declined. Table 2 presents the average switching price in Segment 2, the switchers segment across products, and the ANOVA analysis testing the significance of the price differences between the products.

Table 2: Average switching price for GM potatoes in the switcher segment

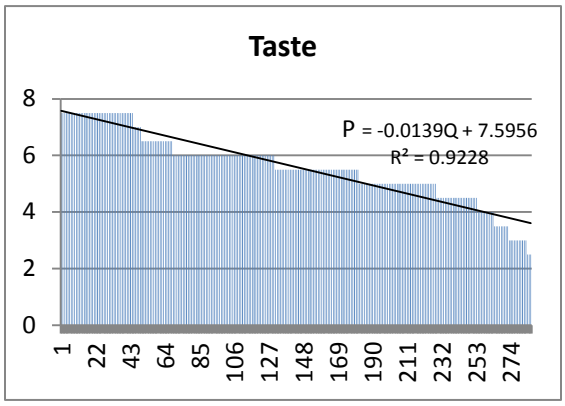
Product	Taste	Anti-oxidant	High-temperature	Low-calorie
	5.21[a] (0.064)	5.34[b] (0.062)	5.41[c] (0.067)	5.09[a,b] (0.073)
N	220	227	191	185

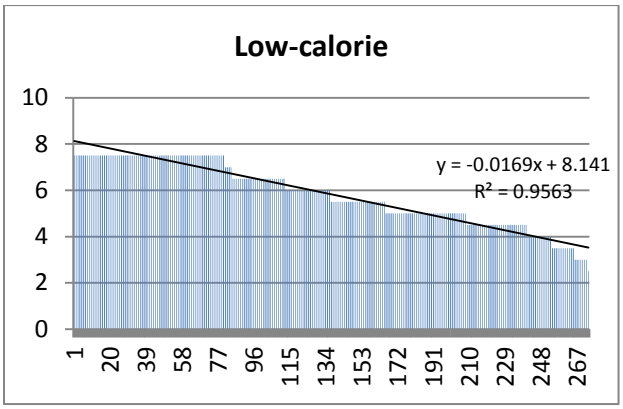
Key: A common letter indicates that the difference in willingness to pay (WTP) between the pair of products is not significant. Price varies between 2.5 and 7.5 NIS per kilogram ($0.7 to $3.5).

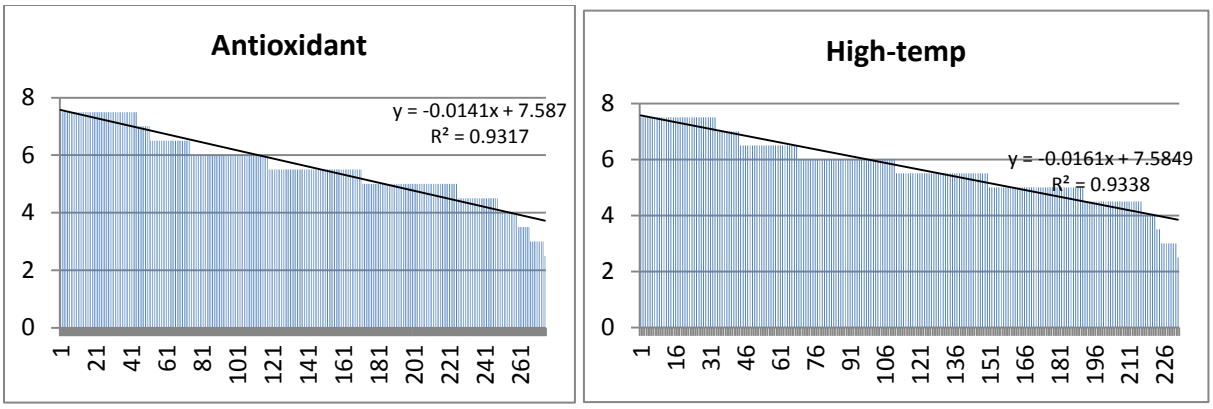
In our sample, consumers who switched between conventional to GM potatoes were willing to pay more for the high-temperature potatoes relative to the other three products. The second highest switching price was for the antioxidant variety. These findings suggest that consumers who are willing to purchase GM products with the capacity to reduce risk directly (lower pesticides) or indirectly (antioxidant) are considering and quantifying the value of risk reduction. This seems to indicate that the challenge that GM industry policy-makers must face is changing the attitude of reluctant consumers.

4.1.3 Adoption of GM food products

Since we did not specify quantity, and these GM products are new (hypothetical) products, the results resemble individually-based adoption decisions. The choice as a function of positioning and price are graphically presented in the following four figures.







Key: Y axis = P, X axis = Quantity.

Consumers were more inclined to choose a potato that was designed to be tastier and were less sensitive to price. The sensitivity to price was highest for the low-calorie potato followed by the high-temperature one. The two products that attracted consumers more than the others were the tasty and antioxidant varieties. Although there were differences between the four products, even for the less successful product positioning (the high-temperature variety), the proportion of consumers who were willing to adopt this product was 64%. The proportion of consumers who were willing to adopt the low-calorie product was 69%, the antioxidant 75%, and the tasty potato reached an acceptance rate of 76%.

Next, we estimated the willingness to adopt the GM food products. The willingness to adopt is measured as a function of consumers' perceptions of the GM products' contribution to health relative to the contribution of conventional potatoes, product taste, importance of potatoes in the consumer's diet, and risk profiles. The latter are part of the choice model (Lusk & Coble, 2005), who considered risk and the level of risk averseness toward GM food in explaining their willingness to purchase GM food.

4.2 Choice of GM products

Let j denote product type, $j=GM,R$ (genetic and conventional, respectively) that is offered at price P_j. The utility from the consumption of product j is denoted by: $U_{j=GM,R}$. The utility is the sum of the deterministic component V_j and unobserved variation ε_{kj}, such that $U_{j=GM,R} = V_j + \varepsilon_j$. We integrated attitude toward risk with Lancaster's (1966) and Kim, Allenby, and Rossi's (2007)

approaches, which assumed that the deterministic element V_j can be approximated by a linear weighted sum of attribute perceptions. Specifically,

$$V_j = w_T T_j + w_H H_j + \sum_{m=1}^{3} W_{R_m} R_m + \mu P_j \quad (1)$$

where w_T denotes the importance weight that is assigned to taste, w_H the importance weight assigned to health, W_{R_m} represents the importance weight assigned to risk factor m, and μ denotes the shadow price of income.

Since a consumer is assumed to choose one unit of a product, either conventional or GM, the demand can be reduced to the probability of purchase. A consumer will purchase product $j = GM$ if :

$$w_T\left(T_{j=GM} - T_{j=TR}\right) + w_H\left(H_{j=GM} - H_{j=TR}\right) + w_R\left(R_{j=GM} - R_{j=TR}\right) + \lambda\left(P_{j=GM} - P_{j=TR}\right) > \varepsilon_{j=TR} - \varepsilon_{j=GM} \quad (2)$$

The probability of choosing a GM food product is represented by

$$\Pr(j = GM) = \Pr\left(V_{j=GM} + \varepsilon_{j=GM} > V_{j=TR} + \varepsilon_{TR}\right). \quad (3)$$

Assuming that the error terms are distributed in a logistic form, Equation (3) and the speciation of V_j (Equation 1) enable us to specify a choice model wherein the odds ratio is given by

$$\theta_j = \frac{exp^{V_{ij}}}{1+exp^{V_{ij}}} \quad (4)$$

(see Aldrich & Nelson, 1994).

Information may affect perceptions (Weber & Johnson, 2005), importance weights (Biehal & Chakravarti, 1983; Chakravarti & Janiszewski, 2004), or both (Heiman & Lowengart, 2008). Information on health hazards is likely to be moderated by attitude toward risk (Lusk & Coble, 2005; Pennings, Wansink, & Meulenberg, 2002). We extend Heiman and Lowengart 's (2008) approach and estimate the choice by

$$\theta_{ji\{i=1\ldots4\}} = \sum_{j=1}^{2} w_T(1+\alpha_i)T_j + \sum_{j=1}^{2} w_H(1+\alpha_i)H_j + \sum_{m=1}^{3} W_{R_m}(1+\alpha_i)\,R_m \quad (5)$$

where α_i represents the effect of information that is conveyed by the GM label and positioning

on the importance factor. Since we have four products each positioned differently, there are four information treatments. β_T, β_H denotes the information adjusted importance factor is the product of the importance weight and the information factor, i.e., $\beta_T = w_T(1+\alpha_i)$, $\beta_H = w_H(1+\alpha_i)$, and $\beta_R = w_{R_m}(1+\alpha_i)$. Following these specifications, the choice is estimated by

$$\theta_{ji;i=\{1\ldots4\}} = \sum_{j=1}^{2} B_T T_j + \sum_{j=1}^{2} wB_H H_j + \sum_{m=1}^{3} WB_{R_m} R_m$$

where θ_j is the choice of product category j (j = *GMF*, conventional). Table 3 presents the estimation results.

Table 3: Choice between genetic and conventional potato types

	Taste		**Antioxidant**		**High-temp**		**Low-calorie**	
	B	Sig.	B	Sig.	B	Sig.	B	Sig.
Taste GM product	0.279 (0.135)	0.038	0.18 (0.16)	0.28	0.228 (0.16)	0.16	0.04 (0.13)	0.77
Health GM product	1.13 (0.18)	0.00	1.07 (0.145)	0.00	0.92 (0.14)	0.00	0.58 (0.12)	0.00
Taste conventional product	-0.09(0.157)	0.528	-0.14 (0.16)	0.37	-0.098 (0.176)	0.58	-0.48 (0.15)	0.75
Health conventional product	-0.406 (0.142)	0.004	-0.17 (0.14)	0.23	-0.31(0.154)	0.04	-0.13 (0.135)	0.34
Potato's importance in menu	0.397 (0.14)	0.006	0.36 (0.185)	0.01	0.375 (0.16)	0.02	0.32 (0.14)	0.02
Income	-0.049 (0.185)	0.79	0.307 (0.185)	0.097	0.129 (0.197)	0.51	-0.05 (0.18)	0.78
Risk FAC1	-0.06 (0.34)	0.97	-0.057 (0.16)	0.72	-0.71 (0.18)	0.69	-0.02 (0.16)	0.89
Risk FAC2	0.19 (0.16)	0.91	0.327 (0.16)	0.04	0.21 (0.18)	0.26	0.23 (0.17)	0.17
Risk FAC3	0.236 (0.17)	0.16	0.117 (0.16)	0.45	0.217 (0.18)	0.24	0.05 (0.16)	0.75
Constant	-3.97 (1.14)	0.00	-5.61 (1.12)	0.00	-4.09 (1.26)	0.01	-1.7 (0.99)	0.08
2 log likelihood	250.8.7		254.2		212.3		251	
Cox & Snell R square	0.28		0.31		0.23		0.16	
% prediction	82%		83.6		83.8		79.5	
N	272		275		275		273	

In the choice task of low involvement products, taste is expected to be the most important attribute, while health is usually an insignificant factor in explaining the choice. Information about health hazards or priming health is expected to shift the consumer to a more complex choice process—one that considers the tradeoff between benefits and risk (Heiman & Lowengart 2011). Since GM labeling is an information signal that is associated with health hazards, then it is expected that food labeled as GM is likely to change the choice process, making the importance weight of health significant. Two out of the four positionings prime health directly, and the low-calorie potato primes it indirectly. Our results indicate that health was a significant attribute in the two products that primed health, while in the two other types—tasty and low-calorie—only the health aspect of the GM potato was significant. Taste significantly affected the choice process only in the case of the tasty potato, which is reasonable given the priming of taste and the lower accessibility to health. Positioning the potatoes as functional food products or on the dimension of risk affected choices as expected, and the greater the potato's contribution to health, the higher the likelihood that it would be chosen. The higher the perception that eating the conventional potato would contribute to health, the lower the likelihood of choosing a GM variety.

Our findings suggest that the higher the potatoes' importance in the family diet, the higher the likelihood of choosing the GM variety, which is quite trivial but makes sense. Income did not affect choice.

The attitude toward risk hardly affected choice. Risk factor 2, which represents risk-taking behavior, was positively related with the likelihood to choose the antioxidant potato, while not affecting the choices of other potatoes, and the two other risk factors did not have a significant effect on choices.

Conclusions and managerial application

Our findings suggest that choosing the positioning of GM food as less risky is problematic. Compared to the other three positioning tactics that avoided specifying the dimension of risk, consumers' likelihood of rejecting the GM product is three to five times higher when risk is primed regardless of the valence of the message, i.e., the information suggests that the product is less risky. Taste, which is of less importance when risk is more accessible, is a much more

successful positioning strategy, as only about 5% rejected the GM product regardless of its price. Rejection is one side of the coin, whereas strong preference toward the GM product is the other. Positioning the GM food as a promise for a better quality of life generated the strongest preference among consumers, and 26.3% preferred the GM product regardless of its price. The positioning as a risk remedy continued to sub-perform, and the proportion of consumers who considered the lower risk GM product as their preferred alternative only approached 10%.

Analyzing the adoption decision for the four products as a function of price strengthens the assertion that positioning a product as a remedy for risk is chancy. The proportion of consumers who adopted the tasty potato was the largest, followed by that of the antioxidant type. The adoption of the high temperature lower-risk potato was the lowest. Note, however, that even for the less successful position that primed low risk, most consumers were willing to pay a price premium relative to the regular potato. Our study suggests that positioning the GM product and using the regulation of such products to deliver information about their benefits may actually increase GM adoption rather than depress it.

From a theoretical perspective, the findings that the importance weight of the different attributes depend on information signals replicates the findings of Heiman and Lowengart (2008) in a different research setting.

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Appendix: Questionnaire

1. The potatoes you are buying in the supermarket are:

1	2	3	4	5	6	7
Not tasty			Somewhat tasty			Very tasty

2. Eating conventionally grown potatoes:

1	2	3	4	5	6	7
Increases health risk			Does not affect health			Reduces health risk

3. Potatoes comprise my daily menu:

1	2	3	4	5	6	7
Not part of my daily menu			Eaten occasionally			Part of my daily menu

The tasty potato is the product of genetic manipulation (GM) wherein a gene found to yield a better-tasting potato was inserted and replaced the existing gene that gave the potato its taste. The tasty potato is ready to be commercially launched. In your opinion, the taste of the genetically engineered tasty potato will be:

1	2	3	4	5	6	7
Not at all tasty			Somewhat tasty			Very tasty

4. Eating the tasty potato will:

1	2	3	4	5	6	7
Increase health risk			Not affect health			Reduce health risk

The table below shows the prices of a conventional potato, and of the genetically engineered tasty potato sold in supermarkets. In each row, please circle your choice (only one).
When the price of a conventional potato is ₪5.00, and the price of the genetically engineered tasty potato is ₪7.50, you chose the conventional potato. Circle the following:

Price of a conventional potato	Price of the GM tasty potato
₪ 5.00	₪ 7.50

Now the prices change. Circle one choice in each row:

Price of a conventional potato	Price of the GM Tasty potato
5.00 ₪	7.50 ₪
5.00 ₪	7.00 ₪
5.00 ₪	6.50 ₪
5.00 ₪	6.00 ₪
5.00 ₪	5.50 ₪
5.00 ₪	5.00 ₪
5.00 ₪	4.50 ₪
5.00 ₪	4.00 ₪
5.00 ₪	3.50 ₪
5.00 ₪	3.00 ₪
5.00 ₪	2.50 ₪

If you choose not to switch between the GM or the conventional potato, please indicate which one you choose (GM/conventional). Circle one.

5. Suppose there are only two potato varieties: a conventional potato, and a genetically engineered potato. Which of the following would you purchase, assuming the price of both potatoes is the same (please circle)?

   The conventional (not genetically engineered) potato/the genetically engineered potato

6. Suppose there are only two potato varieties: a conventional potato, and a genetically engineered, better-tasting, potato. Which of the following would you purchase, assuming the price of both potatoes is the same (please circle)?

   The conventional (not genetically engineered) potato/the genetically engineered potato

The antioxidant potato is a GM potato wherein the gene responsible for producing antioxidant properties is replaced with a gene that produces higher antioxidant levels. In your opinion, the taste of the genetically engineered antioxidant potato will be:

1	2	3	4	5	6	7
Not at all tasty			Somewhat tasty			Very tasty

7. Eating the genetically engineered antioxidant potato will:

1	2	3	4	5	6	7
Increase health risk			Not affect health			Contribute to health

8. The table below shows the prices of a conventional potato and an antioxidant potato, genetically engineered to have a higher antioxidant level than the available varieties sold in supermarkets. In each row, please circle your (one only) choice.

Price of a conventional potato	Price of the GM antioxidant potato
5.00 ₪	7.50 ₪
5.00 ₪	7.00 ₪
5.00 ₪	6.50 ₪
5.00 ₪	6.00 ₪
5.00 ₪	5.50 ₪
5.00 ₪	5.00 ₪
5.00 ₪	4.50 ₪
5.00 ₪	4.00 ₪
5.00 ₪	3.50 ₪
5.00 ₪	3.00 ₪
5.00 ₪	2.50 ₪

If you choose not to switch between the GM or the conventional potato, please indicate which one you choose (GM/conventional). Circle one.

9. Suppose there are only two potato varieties: a conventional potato, and a genetically engineered potato. Which of the following would you purchase, assuming the price of both potatoes is the same (please circle)?

The conventional (not genetically engineered) potato/the genetically engineered potato

10. Suppose there are only two potato varieties: a conventional potato and a genetically engineered potato containing a higher level of antioxidants. Which of the following would you purchase, assuming the price of both potatoes is the same (please circle)?

The conventional (not genetically engineered potato)/the genetically engineered potato

14. The high-temperature potato is genetically modified to increase its frying temperature, reducing the risk of cancer caused by frying that changes the molecular structure of carbohydrates. In your opinion, the taste of the genetically engineered high-temperature potato will be:

1	2	3	4	5	6	7
Not at all tasty			Somewhat tasty			Very tasty

15. Eating the genetically engineered high-temperature potato will:

1	2	3	4	5	6	7
Increase health risk			Not affect health			Reduce health risk

16. The table below shows the price of a conventional potato and the high-temperature potato, genetically engineered to completely eliminate the risk of cancer caused by frying, sold in supermarkets. In each row, please circle your (one) choice.

Price of a conventional potato	Price of the GM high-temperature potato
5.00 ₪	7.50 ₪
5.00 ₪	7.00 ₪
5.00 ₪	6.50 ₪
5.00 ₪	6.00 ₪
5.00 ₪	5.50 ₪
5.00 ₪	5.00 ₪
5.00 ₪	4.50 ₪
5.00 ₪	4.00 ₪
5.00 ₪	3.50 ₪
5.00 ₪	3.00 ₪
5.00 ₪	2.50 ₪

If you choose not to switch between the GM or the conventional potato, please indicate which one you choose (GM/conventional). Circle one.

17. Suppose there are only two potato varieties: a conventional potato and the GM high-temperature potato. Which of the following would you purchase, assuming the price of both potatoes is the same (please circle)?

The conventional (not genetically engineered) potato/the genetically engineered potato

18. Suppose there are only two potato varieties: a conventional potato and a genetically engineered potato completely eliminating the risk of cancer caused by frying. Which of the following would you purchase, assuming the price of both potatoes is the same (please circle)?

The conventional (not genetically engineered) potato/the genetically engineered potato

19. The low-calorie potato is a GM potato into which a gene has been inserted that reduces its caloric content by half compared to the potatoes currently on the market. In your opinion, the taste of the genetically engineered low-cal potato will be:

1	2	3	4	5	6	7
Not at all tasty			Somewhat tasty			Very tasty

20. Eating the genetically engineered low-cal potato will:

1	2	3	4	5	6	7
Increase health risk			Not affect health			Contribute to health

21. The table below shows the prices of a conventional potato and the low-cal potato, the latter genetically engineered to contain only half the calories of the conventional potato, both sold in supermarkets. In each row, please circle your (one) choice.

Price of a conventional potato	Price of the GM low-cal potato
5.00 ₪	7.50 ₪
5.00 ₪	7.00 ₪
5.00 ₪	6.50 ₪
5.00 ₪	6.00 ₪
5.00 ₪	5.50 ₪
5.00 ₪	5.00 ₪
5.00 ₪	4.50 ₪
5.00 ₪	4.00 ₪
5.00 ₪	3.50 ₪
5.00 ₪	3.00 ₪
5.00 ₪	2.50 ₪

If you choose not to switch between the GM or the conventional potato, please indicate which one you choose (GM/conventional). Circle one.

22. Suppose there are only two potato varieties: a conventional potato and a genetically engineered potato. Which of the following would you purchase, assuming the price of both potatoes is the same (please circle)?

The conventional (not genetically engineered) potato/the genetically engineered potato

23. Suppose there are only two potato varieties: a conventional potato and a potato genetically engineered to contain only half the calories of the conventional potato. Which of the following would you purchase, assuming the price of both potatoes is the same (please circle)?

The conventional (not genetically engineered) potato/the genetically engineered potato

24. Please check the answer representing your agreement with the following statements:

	Statement	**1** Strongly disagree	**2**	**3**	**4** Not sure	**5**	**6**	**7** Strongly agree
a.	I would invest 10% of my yearly income in shares on the stock market (high risk–high reward).							
b.	I would invest 10% of my yearly income in government bonds (low risk–low reward).							
c.	I would invest money in a company with financial troubles, on the verge of bankruptcy.							
d.	I often spend money impulsively with no regard for consequences.							
e.	Sometimes I don't use the seatbelt in my car.							
f.	I usually eat high-calorie foods.							
g.	I would go bungee jumping.							
h.	Assuming it was practical, I would chase a hurricane to take dramatic photographs.							

25. Gender (circle one) male/female
26. Age (fill in): _____
27. Your net income range is: (circle one)
    a. 3,500₪ or under
    b. 3,501₪–6,000₪
    c. 6,001₪–10,000₪
    d. 10,001₪–15,000₪
    e. 15,000₪ and over
28. Years of education (fill in) _____
29. **(Academics only)** What was your field of studies?
    a. Social studies
    b. Humanities
    c. Nature and agricultural studies
    d. Sciences
    e. Medicine
30. Do you have children under the age of 18? (circle one) yes/no.