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Consumers' Willingness to Purchase Genetically Modified Products with Superior Benefit when the Conventional Alternative is Risky, and Its Relationship to GM Food

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Scholars believe that in order to increase the acceptance rate of GM food products that offer higher value relative to non-GM alternatives, marketers need to sell them at an introductory price, and only after consumers get used to consuming them can their price be raised. This recommendation is consistent with consumers' demand for discounts on GM food products. This study analyzes whether the opposite strategy—which begins at building a starting point of high risk, and then at a second stage choices between GM and conventional food products are made—is an efficient tactic in introducing biotechnology. Starting high and ending at a lower point is termed the *reverse foot-in-the-door* tactic. We test the effectiveness of reverse foot-in-the-door when applied to GM products by using an experimental survey design wherein consumers are asked first to choose between purchasing two hypothetical biotechnology products—moisturizer and a pill that supports weight loss—and then GM and conventional vegetables, and comparing the results to previous findings taken from the literature. We also identify the variables of the consumers who are willing to purchase both GM beauty-enhancing products and show that these can be used to profile consumers with high willingness to purchase GM food products.

Key words: biotechnology, consumer, cosmetic surgery, genetically modified food, risk.

Introduction

While scientific research has not found any evidence that the production and consumption of genetically modified (GM) foods (e.g., eating meat that was fed GM food) are either directly or indirectly hazardous, consumers are still uncertain about its safety and therefore refrain from its consumption if they have alternatives. Consumers' resistance to GM food (GMF) may be attributed to the perceived benefits thereof that are considered too small to enable tradeoff with perceived risk. While the higher productivity of the agricultural sector resulting from the adoption of biotech may be an efficient remedy to the threatening shortage in food supply and an escape from poverty for farmers in developing countries, this does not encourage the choice of GMF over traditionally grown products on the parts of Western consumers; these consumers are not observing a decline in food prices as more and more acreage is converted to production of GM soybeans and corn. The argument that if biotechnology is not adopted by farmers then food scarcity will cause prices to increase sharply may convince economists trained to think in terms of alternative cost, but not the ordinary consumer.

Yet despite their resistance to GM products designed to increase yield, consumers *are* willing to purchase GMF products that promise to enhance their health, such as vegetables containing antioxidant properties. This is of course illogical, since if there is risk in consuming GM vegetables, one would be better off purchasing conventionally grown and produced food and getting one's antioxidants by consuming nutritional supplements, but individuals are not always logical.

Given the findings that consumers are willing to trade risk for health benefits, or even for [the benefit of] improved taste, one way to facilitate adoption of GM products is to develop high-benefit products; the other is to develop products that reduce risks associated with consumption of conventional food products. Scholars believe that either way—high benefit or low risk—marketers need to offer GMFs at an introductory price, and then only after consumers get used to the idea of consuming it can its price be raised. This recommendation is consistent with consumers' demand for discounts on GMF products.

This study analyzes whether the opposite strategy—which begins at a high starting point and reduces the target price or efforts at the juncture wherein the

important choices are made (i.e., choice of GM food)—is an efficient tactic in introducing biotechnology. Starting high and ending at a lower point is termed *reverse foot-in-the-door.* The foot-in-the-door (FITD) tactic is based on the notion that if a consumer is willing to try something small (one-time consumption, purchase of new product at an introductory price), the likelihood of adoption on a large scale (repeat purchases, buying at full price) increases. Reverse foot-in-the-door is based on the idea that a high starting point linearly increases the equilibrium price or other measure of the result.

Experiments aimed at eliciting risk perceptions and attitudes toward these products ask consumers to choose among lotteries that vary in their payoff and risk (Gürhan-Canli & Batra, 2004; Lusk & Coble, 2005; Lusk et al., 2004; Slovic, Finucane, Peters, & MacGregor, 2004). The tradeoff between risk and benefit is then used to estimate choice rules and utility functions. In the case wherein the study aims at exploring how differences in perceptions of risk affect choice strategy, the experiment is designed to increase (decrease) the accessibility to risk. Psychologists and consumer behavior scholars manipulate perceptions of risk either by priming risk (Weber & Milliman, 1997) or by asking consumers to imagine various scenarios that vary in their inherent risk (Campbell & Goodstein, 2001; Murray & Schlacter, 1990) —such as choosing a strong versus a weak brand—or between new and established products or innovations (Shimp & Bearden, 1982). The third tactic used to manipulate risk is to ask consumers to choose between a high risk/high benefit product and a seemingly safe product that provides lower benefit. Considering risk increases its accessibility and in turn affects its importance weighting in successive judgment tasks (Weber & Johnson, 2005). We followed the latter methodology.

The analogy in the case of biotech is aiming high by offering consumers a desirable yet risky biotech product, riding on the coattails of their acceptance, and offering them non-hypothetical GM products. The reverse FITD tactic is compared to the control by placing the choices of the high-risk products in the introduction of the survey.

The first product used to increase the accessibility to risk is a biotech anti-wrinkle moisturizer, and the second is a GM weight-loss pill. The analogous conventional products (services) fail in most cases to provide their promised benefits. The alternatives that do succeed in eliminating wrinkles and promoting a younger appearance and that increase the likelihood of permanent weight loss, i.e., cosmetic and medical surgeries, are very risky. Though uncertain, the biotechnology alternative—when compared to high-risk treatment—therefore offers the possibility of a successful solution, yet it comes with risk. Benefit must increase with risk; otherwise, the risky choice will be rejected automatically (Slovic, Fischhoff, & Lichtenstein, 1982).

Using experimental survey design, we find that the same latent variables that account for acceptance of hypothetical biotech physical-appearance-enhancing products explain the choices of GMFs, i.e., consumers who are willing to purchase and use biotech physical-appearance-enhancing products are also willing to purchase GMF products. We also find that the reverse foot-in-the-door tactic increased the acceptance rates of GM produce as compared to findings from previous surveys and experiments.

Literature and Construction of Research Hypotheses

Previous literature suggested that in contrast to general resistance to GMF that is attributed to the risk associated with its consumption overshadowing price benefits (Huffman, Rousu, Shogren, & Tegene, 2004), consumers are willing to purchase produce that offers enhanced benefits produced using biotechnology (Colson, Huffman, & Rousu, 2011; Uzogara, 2000). In studies wherein consumers were asked to choose between a mainstream agricultural product and a GM product offering a specific benefit (such as enhanced nutritional value), consumers showed inclination to purchase the GM product and pay a price premium (Colson & Huffman, 2011). These findings suggest that consumers are willing to trade risk for benefit when the benefits are tangible and significant, and therefore the development and introduction to the market of health-enhancing GM produce is believed to be a promising avenue to accelerating GMF acceptance. Hence, it is expected that the greater the benefit offered, the higher the likelihood of purchasing biotech-based products. Hypothesis 1 summarizes the aforementioned discussion:

> H1: The higher the perceived benefit, the higher the acceptance rate of GM products.

Reduction of risk increases the expected benefit as well; therefore, if GM has the potential to reduce high risk associated with consumption of mainstream products, it may increase the likelihood of purchases of GMF products. On the other hand, marketing GMFs using the argument of less pesticide may prove to be a double-

edged sword, as information on lower risk may actually increase the accessibility of risk, and in turn increase the importance weights that consumers assign thereto. Consequently, using less pesticide as a selling point may actually serve to reduce support levels (Krishna & Qaim, 2008). Following this discussion, it is hypothesized that

> H2: Using the reduced pesticide level of GM products as a selling point may actually reduce consumer acceptance.

Foot-in-the-door and Its Reversal

The foot-in-the-door model is based on the notion that it easier to commit or agree to something that bears a low cost (risk) than to something that involves high risk (cost). Agreement to the smaller step increases the likelihood of a larger-scale commitment/purchase (Burger, 1999; Freedman & Fraser, 1966). There are several theoretical explanations for this phenomenon. First, agreement to a small request is consistent with consumers' desire to portray themselves as generous and willing to help, and therefore openness to getting involved with larger-effort commitment aims to maintain this self-image (Beaman, Cole, Klentz, & Steblay, 1983). Second, both actions activate the same mental process, so it is easier to accept a larger commitment once the smaller one has already been carried out (Scott, 1976). The third explanation refers to the anchoring heuristic (Tversky & Kahneman, 1974): since consumers are generally not informed, they take the first piece of information they encounter as an anchor, and refer to it in subsequent judgments.

The foot-in-the-door strategy has been applied to auction pricing, i.e., starting low and ending high (Ku, Galinsky, & Murnighan, 2006); to membership and subscription offers that offer the first period at a reduced price; and to charitable donations.

The reverse foot-in-the-door mechanism is largely based on anchoring heuristics and was studied in the context of personal goals (Mussweiler & Strack, 2000) and negotiation (Galinsky & Mussweiler, 2001). According to the model, while a high initial offer increases the closure price linearly, it decreases the likelihood of closing the deal since it discourages buyers. The reverse foot-in-the-door tactic has been tested in various areas such as court convictions. It is hypothesized that consumers exposed to a high-risk scenario are more likely to accept low-risk offers, and therefore acceptance of GMF is likely to be higher. Hypothesis 3 summarizes this.

> H3: The acceptance of GM food is likely to be higher when consumers are exposed first to a high-risk scenario relative to the control.

In the next section, we test our hypotheses. First we describe the research and data collection procedure and then present the empirical results.

Methodology

Subjects

The survey included 366 female respondents. Most of our respondents were married (61.8%); 28.1% were unmarried; and 10.1% were divorced or widowed. The distribution of personal status is similar to that of the Israeli census (Israeli Central Bureau of Statistics [CBS], 2004). Most of the respondents have a high school or equivalent education (65.5%); the remaining (44.5%) are academic undergraduates or graduates. The educational background of the sample is similar to that of the Israeli population (49.3% having post-secondary education). Respondents' age distribution is likewise very similar to the Israeli age distribution.

Data Collection

Questionnaires were distributed to respondents at gyms, workplaces, drugstores, and beauty salons. Interviews were held throughout the week in an effort to ensure higher representativeness of the sample.

Results

Consumers' willingness to try GMF products after risk is primed (i.e., reverse foot-in-the-door tactics) and is higher for food with reduced pesticide levels (5.35 out of 10) than to their willingness to purchase GMF that is tastier than the conventional product (4.76). The difference between willingness to purchase the two GMFs is statistically significant at the 0.05 level.

The difference between the acceptance rate of biotech beauty-enhancing products and GMF products depends on the nature of the product. While willingness to purchase is higher for moisturizer than for GMFs regardless of their benefits, willingness to purchase the biotech weight-loss pill is significantly lower. These findings partially support Hypothesis H1. Hypothesis H2 is rejected, consistent with Heiman, Agmon, Fleisher, and Zilberman (2011).

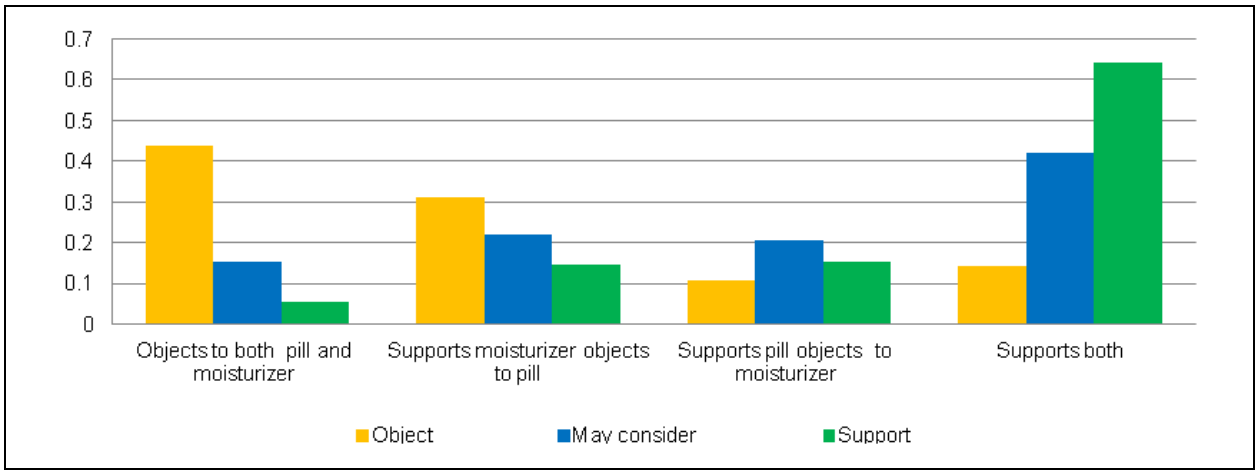

Figure 1. WTP GM vegetables with low pesticide as a function of WTP biotech beauty products.

Average willingness to purchase GMF in our study is higher than that reported by Krishna and Qaim (2008);[1] Hamilton, Sunding, and Ziberman (2003); Canavari and Nayga (2009), which demonstrated a 32% average; Boccaletti and Moro (2000), which reported a 30.5% and 34.5%, respectively; Knight, Holdsorth, and Mather (2007);[2] and Lusk et al. (2004).[3] Some studies, however, reported higher acceptance levels, such as that of Heiman et al. (2011), who demonstrated levels of 60.9% for better-tasting product and 83.7% for lower-pesticide vegetables; and Ganiere, Chern, and Hahn (2006), who reported a 68.4% acceptance level. This result partially supports Hypothesis 3.

There is a strong, significant correlation between willingness to purchase GMFs grown with less pesticide and willingness to purchase GM moisturizer (F value of 3.96) and GM weight-loss pills (F value of 6.45). The relationship between choosing GMFs when the main benefit is improved taste and willingness to buy biotech-based beauty products is not significant. Figure 1 illustrates this relationship.

The relationship between willingness to purchase GMF products and willingness to try the GM beauty-enhancing products suggests that individuals who are willing to consider both beauty-enhancing products also have a strong inclination toward purchasing GMFs, and vice versa.

Next, we estimate willingness to purchase the GM products as a function of socio-demographic variables and consumers' tendencies to purchase GM beauty-enhancing products. We estimated the following OLS regression wherein the explanatory variables are age, education level, monthly household income, self-reported interest in biotechnology, and willingness to try the GM beauty-enhancing products. Specifically,

$$Y_{GMF_{j=tates,pest}} = a + \sum_{i=1}^{3} b_1 X_i + \sum_{i=1}^{2} b_2 Z_i + b_3 bio\text{inf} + \varepsilon . \quad (1)$$

$Y_{GMF_{j=tates,pest}}$ measures consumers' willingness to purchase GMF products that are either tastier or require less pesticides. $\sum_{i=1}^{3} b_1 X_i$ refers to the socioeconomic variables of age, education, and household income; $\sum_{i=1}^{2} b_2 Z_i$ represents the reverse foot-in-the-door stimulus willingness to purchase the GM moisturizer and GM diet pill; and *bio*inf refers to self-reported exposure to information on biotechnology. Table 1 presents estimation results.

Willingness to purchase biotechnology-based beauty-enhancing products (moisturizer and weight-loss pill) significantly increased willingness to purchase GMFs grown using less pesticide and willingness to purchase GMF products with enhanced taste. Our findings indicate that consumers who are willing to try biotechnology beauty-enhancing products are also more inclined to purchase GM food products. Older and better-educated consumers are less inclined to purchase

1. *While the average is 55%, respondents' perceived risk from pesticide exposure reduced their willingness to purchase GMF.*
2. *20% for low-pesticide fruits.*
3. *Willingness to accept (WTA) declined when consumers were informed that the GMF has lower pesticide levels, e.g., the compensation for GM declined, yet were still positive.*

Table 1. Results of the choice to buy GM food with lower pesticide levels and tastier GM food products.

	Lower pesticide			Better taste		
	Marginal effect	**t**	**Sig.**	**Marginal effect**	**t**	**Sig.**
(Constant)	4.5 (0.80)	5.6	0.00	4.8 (0.79)	6.04	0.00
Age	-0.24 (0.14)	-1.73	0.08	-0.40 (0.14)	2.84	0.04
Education	-0.24 (0.18)	-1.31	0.19	-0.36 (0.18)	1.98	0.05
Monthly household income	-0. 3 (0.25)	-1.19	0.24	0.23 (0.25)	0.93	0.35
Willingness to buy GM moisturizer	0.35 (0.04)	8.24	0.00	0.30 (0.04)	7.27	0.00
Willingness to buy GM weight-loss pill	0.20 (0.05)	4.1	0.00	0.26 (0.05)	5.16	0.00
Have read articles on biotechnology	0.57 (0.32)	1.74	0.08	0.29 (0.33)	0.86	0.38
Adjusted R^2, F	0.22; 22.2			0.27; 23.3		

Note. Dependent variables: Willingness to purchase GM food with reduced pesticide, better taste
Numbers in brackets=standard error

GMF products, except for GM products that are grown with less pesticide, wherein education does not affect willingness to purchase. Income does not affect preferences; however, having read articles on biotechnology reduced willingness to buy the tastier GM product.

Conclusion and Future Research Directions

This article challenges traditional foot-in-the-door tactics believed to facilitate adoption of GMF products. FITD strategy is based on the idea that the likelihood of adoption of GMF products is conditioned on the introduction of products that provide better value than that of conventional food and that cost less than conventionally grown products. After consumers get used to the idea that GMF does not harm immediately, and since most consumers are myopic in their choice strategies, GM will be adopted and its price can be raised.

We test the hypothesis that under reverse foot-in-the-door tactics—i.e., start at a very high price (risk), as well as when a discount is offered in order to close the deal—the equilibrium price (risk) is still higher than that achieved using any other tactics. Since this is not a lab experiment in auction pricing, but rather a survey on biotechnology acceptance, there was a need to adapt the procedure to the scenario at hand. This was done by first asking consumers to choose between a hypothetical biotechnology beauty-enhancing product that offers higher benefit than does food, yet at higher risk as well. After this phase, consumers were asked to choose between two GM vegetables (unspecified), one with the benefit of less pesticide, and the other with the benefit of better taste. After making choices that involve high risk, the low perceived risk of GM should be deflated and therefore its acceptance rate should be higher.

This article shows that the acceptance rate for GM products is higher than that reported in the majority of studies. We found that consumers who are more willing to take the risk and purchase biotech beauty-enhancing products are likewise more likely to purchase GM vegetables. This finding indicates that risk profiling of consumers may prove efficient in segmentation, which always increases the efficiency of marketing efforts.

Using lower risk as the marketing focal point may backfire. The recommendation to provide consumers with reliable information that aims at reducing overestimated risk is questionable, as risk stimuli can increase the accessibility to the perceived unsafe nature of the product, thereby actually increasing uncertainty. Although we showed in this study that lower-pesticide GMF obtained better acceptance rates than did tastier GMF, a more systematic study needs to be conducted in order to support this direction.

An indirect support of the assumption that consumers seek products that will allow them to control the health risks to which they are exposed is the growing adoption of organic products despite the controversy over their contribution to health. If this argument holds also for GMF products, then we expect to find that a large proportion of consumers will be willing to con-

sider biotechnology-based products that substitute for conventional products whose production (or nature) increases health hazards. However, it is rather complicated to provide information on vegetables and fruits whose health benefits many health organizations are trying to promote while arguing that they may contain pesticide residues. Therefore, the reverse foot-in-the-door policy has potential for promoting GM without harming conventionally grown foods.

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