Functional Food Choices: Impacts of Trust and Health Beliefs

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Abstract

This study examines determinants of consumers' choices for functional canola oil products that may contain GM ingredients, with particular emphasis on the roles of health beliefs and trust. We find that both generalized trust and trust in the food system tend to offset negative perceptions associated with GM food and that respondents who believe in internal control over health are more likely to purchase functional food. Our results also show that the disutility associated with GM food ingredients outweighs the value that respondents place on the enhanced omega-3 content in a canola oil product, suggesting that using genetic modification to enhance levels of omega-3 content in canola oil products is unlikely to be desired.

Keywords: functional GM food; trust; health beliefs

1. Introduction

Significant increases in health care costs of chronic diseases associated with diet and lifestyle raise concern by governments and individuals. Among other initiatives, this prompts interest in dietary improvements including functional foods. Functional foods provide additional physiological benefits beyond meeting basic nutritional needs (Hasler, 2002). The belief that "eating right" improves quality of life together with developments in nutritional science, have raised interest in potential markets for functional foods.

Modern biotechnology can potentially be used to increase levels of desired food characteristics. However, this is a controversial topic. The first generation of genetically modified (GM) foods, viewed to lack direct benefits for consumers and to have risk possibilities, met with considerable resistance in some countries. It has, however, been suggested that potential benefits may offset negative perceptions of at least some types of genetic modification (Frewer et al., 1997; Gaskell et al., 2004; Hu et al., 2004). GM foods with higher nutritional values or longer storability have been projected to be developed (Lheureux et al., 2003). A question of interest is whether/to what extent consumers will accept functional GM foods if they are aware of both potential benefits and risks associated with such products.

Studies of consumers' potential acceptance of functional GM food have mixed findings. Marin and Notaro (2007) studied Italian consumers' preferences for a hypothetical yoghurt product containing GM enzymes with anticancer properties and found no evidence that these health benefits offset negative perceptions of gene technology. Loureiro and Bugbee (2005) found consumers to be willing to pay premiums for tomatoes with enhanced flavor and nutritional value, but premiums were small relative to difficulties of marketing food products with GM ingredients. Hu et al. (2004) found market segments which varied considerably in willingness to accept GM-derived food with nutritional or environmental attributes. Ding et al. (2012) found consumer's concerns with a functional GM canola oil to be considerably influenced by trust. In spite of extensive studies on consumers' acceptance of GM food, it is not clear why some individuals appear to be relatively indifferent to GM-

derivation, while others are highly averse. The aim of this study is to understand better the bases for such choices.

Health impacts of functional GM foods cannot be directly verified by consumers, even after such foods have been purchased and consumed, indicating that these are credence attributes. This raises interest in the influence of individual's health beliefs, in addition to their trust attitudes, on decisions regarding functional GM foods. Since trust is seen as a plausible strategy to reduce uncertainty, we hypothesize that trusting consumers are less averse to functional foods with GM ingredients than those who are not trusting and that individuals who believe that their health is contingent on their own behavior are more likely to engage in health-promoting behaviors, like purchasing functional food.

The market for functional foods is expanding, illustrating the need for better understanding of consumers' decision-making for these foods to guide food policy and commercial decisions. Recognizing the potential of biotechnology to increase nutritional components, this study examines the influences of both health beliefs and trust on Canadian consumers' food choices in the context of canola oil with a functional food component, omega-3 content, which may be associated with genetic modification. Our findings are expected to contribute to policy through a better understanding of consumers' decision-making for food with risky and health-promoting characteristics and may also provide insights for the food industry in developing new products and marketing strategies.

2. Literature: Determinants of consumers' food choices

There have been numbers of studies on determinants of consumers' purchase intention for a variety of food products, including organic, GM and functional food. Some have focused on the impacts of socio-demographic characteristics, health attitudes, and knowledge on consumers' decision making for food products. Verbeke (2005) found attitudinal factors, such as belief in the health benefits and knowledge of a functional food to better predict its acceptance than individual's socio-demographic characteristics. Labrecque et al. (2006) concluded that beliefs in product- or health-related benefits, along with information credibility, are major predictors of consumer

acceptance of functional foods. Cultural differences are also found to contribute to variability of acceptance of these foods (Bech-Larsen and Grunert, 2003; Labrecque et al., 2006).

The health impacts of functional GM foods are credence attributes. Although this feature has sparked interest in the influence of trust on decision-making for food, little attention has been paid to the impact of health attitudes on food decision-making and we have not located any studies on the combined influence of both features. Several studies examine how consumers' trust in information source and regulatory institutions affect purchasing decisions and willingness to pay for GM food (e.g., Huffman, 2003; Hossain and Onyango, 2004). These view trust as consumers' confidence in organizations. Trust is, however, a complex and hard-to-measure concept. There is empirical evidence that generalized trust, which essentially reflects an individual's world view, also plays an important role in decision-making under risk (Bonoma and Johnston, 1979; Glaeser et al., 2000; Unslaner 2002). Ding et al.(2012) find that consumers who do not trust strangers and the food system are more likely to be anti-GM consumers. In this study, we use different model forms than Ding et al. (2012) and combine both trust in the food system and generalized trust with an individual's health attitudes to investigate how these influence decision-making for a functional GM food.

Although earlier literature was described, overall, as inconclusive (Norman et al., 1998), linkages between health beliefs and behaviors are increasingly recognized and are of interest to many scholars (Norman and Bennett 1996, Norman et al. 1998, Steptoe and Wardle, 2001). Research has identified significant differences in people's perceptions of control over their health which influence participation in health behaviors like reducing sodium consumption (Cox et al., 2004). Health locus of control (HLC) measures health-specific perceptions of control. One widely-used measure is the Multidimensional Health Locus of control scale (MHLC) developed by Wallston et al. (1978). This measures the degree to which an individual believes that his health is contingent on his own behavior, controlled by powerful others, or by chance. Although many studies have focused on how various measures of the HLC construct affect peoples' participation in different health behaviors, little, if any work,

has examined its influence on choices of food products that have health-enhancing attributes. In this study, we examine consumers' choices for functional foods that may be associated with genetic modification, with particular emphasis on whether and how health beliefs, in conjunction with trust, affect consumers' decision-making.

3. Data and descriptive analyses

3.1 Survey design and data collection

The data employed in this study were collected in 2009 through a Canada-wide internet-based survey of stated choices of canola oils, a product that is familiar to and commonly consumed by Canadian households, with specified attributes. The attributes considered in the purchase of canola oil products are price, GM/non-GM ingredients, omega-3 content, and country of origin. Focus on the health attribute of omega-3 content is motivated by the growing market for omega-3 enhanced functional foods. GM canola oil with enhanced omega-3 content has not entered the market.

The survey questionnaire was assessed by two focus groups of members of the public and involved two-pretests. Respondents' preferences for functional GM foods are assessed by a stated choice experiment simulating market purchases. The attributes and their levels are presented in Table 1. A fractional factorial design generated a total of 48 choice sets which were blocked into eight segments with six choice questions in each segment. Each question offers three options: two different canola oils and a "no purchase" alternative. Different measures of generalized trust are queried, as is trust in specific agents in the food system (government, food manufacturers, farmers and retailers) in the context of food safety. Information on respondents' MHLC, health behaviors, views of risks and socio-demographic characteristics is also obtained.

Following two pretests the survey was applied by a major marketing company to a sample drawn from their large representative panel of Canadian consumers. The recruited sample of 1009 respondents that completed the questionnaire are 18 years or older, do more than 50% of household grocery shopping, and buy canola oil from time to time. Comparison of major demographic characteristics of the sample with the

Canadian population shows that the sample is slightly biased towards older, more educated people, with an income level that is slightly lower than average household income reported in the 2006 Census of Canada. The geographic distribution of survey respondents is very close to the Canadian population distribution. There are more women (58.4% of respondents) than men in the sample, but since women tend to do more household grocery shopping, this is realistic.

3.2 Trust and risk perceptions of GM food with enhanced nutritional qualities

The focus of this study is investigation of the influences that beliefs in control over health and trust have on individual's choices of a GM functional food. It is generally assumed that trust tends to offset negative perceptions associated with GM food (Siegrist et al., 2005; Lang and Hallman, 2005). Consequently we expect that respondents who trust tend to perceive lower levels of risk of GM functional food than those who are not trusting. One frequently used measure of generalized trust is the attitudinal question, "Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?" Some scholars argue that trust between strangers is important for all social relations, and is close to generalized trust (Eisenberg 2007; Uslaner, 2002). Following Glaeser et al. (2000), we apply these two measures.

To measure consumers' trust in the food system we adopt the attitudinal questions developed by de Jonge (2008), which focuses on four agents involved in the food system: government, manufacturers, farmers and retailer. Trust in each agent is measured by responses to six statements relating to three dimensions: competency, honesty, and actions in the public interest. Trust in each agent is calculated by adding up each respondent's rating scores across these six items. The summation of trust scores for the four agents gives each respondent's measure of trust in the food system overall.

One question in the survey queries respondents' views of the riskiness of "genetically modified crops to increase nutritional qualities of food". Table 2 summarizes responses to this question for those who indicated "most people can be trusted" versus those who responded "can't be too careful in dealing with people" to

the generalized trust question. As seen in that table, 15.4% of the trusting group rated this type of food as “high risk” while 21.3% indicated “almost no risk”. In contrast, considering the group that is not trusting, 22% of respondents indicated this type of food to be “high risk”, while only 16.7% chose “almost no risk”. Table 2 demonstrates that trusting respondents are less averse to GM food with increased nutritional qualities than are non-trusting respondents.

Table 3 provides similar information relative to responses to the institutional trust question. Respondents are grouped into three categories based on their scores for trust in the food system. Table 3 shows that 13.8% of the most trusting group perceived GM food with increased nutritional qualities as “high risk”, whereas 41.1% of the least trusting group perceived this food to be “high risk”. Comparison of respondent’s risk perceptions across the three trust groups shows that respondents who exhibit the highest level of trust in the food system are the least likely of any of the groups to rate this type of food as “high risk” and are the most likely to rate this as “almost no risk”. Tables 2 and 3 suggest that generalized trust and trust in the food system tends to influence perceptions of risk associated with functional GM food.

3.3 Health locus of control beliefs and food choices

We employ the Multidimensional Health Locus of Control (MHLC) developed by Wallston et al. (1978) and collected data for this in the survey. The MHLC scale contains three subscales: internal control, chance, and external control. Each subscale consists of six belief statements. Respondents were asked to indicate their agreement/disagreement on each statement using a Likert scale (1=strongly disagree; 6=strongly agree).The score on each subscale is the sum of the values for each item on the subscale. The three subscales are independent of each other (Wallston et al 1978). It is generally assumed that people with strong internal health beliefs tend to engage in health-promoting behaviors (Norman et al., 1998). Therefore, in the following analyses, we focus only on the internal health locus of control (IHLC) and examine the associations between the IHLC beliefs and food-related attitudes and behavior.

In Table 4, we compare the IHLC beliefs between respondents who state that "food choices are very important in supporting health" and those who don't think food choices are important for health. The IHLC mean score for the group that believes food choices are important for health is 26.37; the mean score for the other group is 24.28. By construction, larger numbers indicate a stronger belief in internal control over health. The t-test shows that the difference between these two mean scores is significant at the 1% significance level, suggesting that respondents who have stronger beliefs in their own control over health also tend to believe that there are strong associations between food choices and health.

Table 5 examines whether respondents who buy organic food regularly have stronger beliefs in internal control than those who have never bought organic food. As indicated, organic food buyers have a mean score for the IHLC of 27.19, and respondents who do not buy organic food have a mean score of 25.71, which is significantly less. Evidently, people who believe that their health is contingent on their own behavior are more likely to buy organic food. Table 6 shows that respondents who seek health information regularly have a slightly larger mean score on the IHLC scale than respondents who report seeking health information only occasionally, 25.77 versus 25.57. However, the difference between these two mean scores is not statistically significant. Overall, Tables 4 to 6 indicate that respondents with strong internal health beliefs are more likely to engage in food-related health-promoting behaviors.

4. Econometric model

We examine how the IHLC beliefs and trust affect consumers' stated choices for functional canola oil products, employing the random utility model. These models of discrete choices assume that decision maker n chooses the alternative that maximizes utility when facing choices among j alternatives. U_{ni} denotes the utility that decision maker n obtains from choosing product i. Utility is decomposed as $U_{ni} = V_{ni} + \varepsilon_{ni}$, where V_{ni} is a function of the attributes of product i (x_i) and the characteristics of the decision maker n (z_n), and ε_{ni} denotes a random component of the utility function. Given the attributes of GM/non-GM canola oils specified in this study, V_{ni} takes the form:

$$V_{ni} = \beta_0 Buynone_i + \beta_1 Eomega3_i + \beta_2 Comega3_i + \beta_3 GM_i + \beta_4 NoGM_i + \beta_5 CAN_i + \beta_6 Price_i \quad (1)$$

The definitions of the variables are given in Appendix Table A1.

The probability that decision maker n chooses alternative i is:

$$P_{ni} = Prob(U_{ni} > U_{nj} \; \forall \; j \neq i)$$

$$= Prob(V_{ni} + \varepsilon_{ni} > V_{nj} + \varepsilon_{nj} \; \forall \; j \neq i)$$

Assuming that the error terms are independently, identically distributed (iid) extreme values, the conditional logit choice probability of individual n choosing product i is:

$$P_{ni} = \frac{e^{\beta' x_{ni}}}{\sum_j e^{\beta' x_{nj}}} \quad (2)$$

where $\beta' x$ is the deterministic part of the utility function defined by equation (1), and β is a vector of parameters to be estimated. In a conditional logit model, consumers' willingness to pay (WTP) for attribute k can be calculated by:

$$WTP = -\frac{\beta_k}{\beta_p} \quad (3)$$

where β_k is the estimated parameter of the kth attribute, while β_p is the coefficient on price.

The conditional logit (CL) model illustrated above assumes homogeneous preferences across respondents. However, consumers often differ in their preferences. Accommodating preference heterogeneity in model specification and estimation enhances the accuracy and reliability of model estimates (Greene, 2003). A common approach to account for preference heterogeneity is to interact the characteristics of respondents with the attributes of the product alternatives and incorporate these interaction terms into equation (1). Following this approach, we modify equation (1) to include interaction terms between respondents' social-economic, demographic and attitudinal characteristics with the attributes of the canola oil products. We expect both generalized trust and trust in the food system will tend to offset the negative perceptions of GM food. This hypothesis is tested by examining the interaction effects between the trust variables and the GM attribute. The influence of health locus of control beliefs on decision-making is similarly assessed by interacting the IHLC belief variable with the omega 3 and the GM attributes. We expect people with a

stronger belief in internal control to be more likely to purchase canola oils with an enhanced level of omega 3 and to tend to avoid food with GM ingredients.

5. Empirical results

5.1 Results of the CL models

The results of CL model estimation are presented in Table 7. Model (1) is the base model and includes only the attributes of the canola oil products. Models (2) and (3) consider preference heterogeneity and differ only in the interaction terms between the trust variable and the GM attribute. In Model (2), trust in strangers is used as a proxy for generalized trust.[1] In Model (3), trust is measured by respondents' trust in the food system. Variable definitions are given in Table A1.

Results from all models show that consumers are averse to not purchasing any canola oil product as the alternative specific constant of the "no purchase" option (Buynone) is negative and significant in each of the models. Consumers value the health benefits of omega-3: the coefficients on both "enhanced omega 3" and "contains omega 3" are positive and significant. Consistent with expectations and previous empirical analyses, consumers do not like canola oils with GM ingredients and canola oils labeled as non-GM are preferred. The results also suggest that Canadian consumers prefer domestic canola oils over canola oils produced in the U.S.

Preference heterogeneity is considered by interacting the characteristics of individuals with the attributes of the product alternatives. We find that respondents' demographic characteristics affect their valuations of the GM attribute and the omega 3 attribute. Men tend to value GM oils more than women. Age has a negative impact on the valuation of the GM attribute. People residing in Quebec are more averse to GM oils than people residing in other regions of Canada. We also find that respondents with a university degree are more averse to GM-derived canola oils than those with lower levels of education. Regarding the omega-3 attribute, people with higher income place more value on the health benefits associated with omega-3

[1] We also estimated a model version in which generalized trust is measured by the frequently used trust question, "generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?" We found trust measured by this question to have no explanatory power for respondents' choices.

content. The coefficients on the interaction terms between income and the two omega 3 labels, “enhanced omega 3” and “contains omega 3”, are both positive and significant.

The influence of trust on respondents’ valuation of the GM attribute is examined in Models (2) and (3). The results of Model (2) show that the coefficient on the interaction term between trust in strangers and the GM attribute is positive and significant, suggesting that respondents who exhibit trust in strangers are less averse to GM oils than those who do not trust strangers. In Model (3), the variable expressing trust in the food system is interacted with the GM attribute. The coefficient on this interaction term is also positive and significant, indicating that trust in the food system partially offsets the negative perceptions of GM food.[2]

It is expected that respondents with a stronger belief in internal control over health value functional food more. This is tested by interacting the health locus of control variable with the omega 3 label of “enhanced omega 3”. In both Models (2) and (3), the coefficient on this interaction term is positive and significant, suggesting that respondents with stronger belief in personal control over health place more value on the health attribute of omega 3 and are more likely to choose canola oils with enhanced levels of omega 3. We also postulate that respondents with strong beliefs in internal control tend to avoid food with risky attributes. However, the coefficient on the interaction term between the internal control variable and the GM attribute is not significant in either Model (2) or Model (3) indicating no evidence that the IHLC beliefs affect respondents’ acceptance of food with GM ingredients.

5.2 Valuing the attributes of functional canola oils

The success of any development and marketing of functional GM food is subject to consumers’ acceptance of this type of food product. Consumers’ valuations of the attributes of a functional food should be of interest to both policy makers and the food

[2] Trust in the food system is measured by the summation of the trust scores for four food agents, government, farmers, manufacturers, and retailers. We examined the influence of trust in each of these four food agents on respondents’ valuation of the GM attribute respectively and found that trust in each food agent positively influences respondents’ valuations of the GM attribute.

industry. We calculate respondents' willingness to pay (WTP) for the attributes of functional canola oil products from equation (3). The WTP estimates corresponding to Models (1) to (3) are presented in Table 8. Since the focus of this study is to examine how health beliefs, in the form of the health locus of control, in addition to trust, influence choices of functional food, we also report the WTP estimates for consumer segments that vary in health beliefs and trust.

As seen in Table 8, the WTP estimates for the attributes of "Contains omega 3", "Non GM" and "Canada" are similar across the three models. The WTP estimates derived from Model (1), the base case, show that a representative consumer is willing to pay CAN $0.95 for the attribute of "Contains omega 3", CAN$0.60 for the "Non GM" attribute, and CAN$1.45 for the country of origin label indicating a Canadian product. Table 7 gives results from Models (2) and (3). These suggest that trust affects respondents' valuation of the GM attribute and that health beliefs influence respondents' valuations of the "Enhanced omega 3" attribute. Consequently, in Table 8 we present WTP estimates for the two attributes for groups of respondents who differ in their levels of trust and locus of control beliefs. A representative consumer's WTP for the attribute of "Enhanced omega 3" derived from Model (1) is CAN$0.86. Based on the results from Model (2), we calculate the WTP for "Enhanced omega 3" by respondents who believe in strong internal control and respondents with a lower level of internal control. As can be seen, respondents with strong internal control are willing to pay CAN$0.99 for the attribute of "Enhanced omega 3", whereas respondents with a lower score on the internal scale are willing to pay only CAN$0.54 for enhanced levels of omega 3. The WTP for enhanced levels of omega 3 derived from Models (2) and (3) are similar. In Model (2), we examined how generalized trust affects respondents' valuation of the GM attribute. The WTP estimates in Table 8 show that respondents who exhibit trust in strangers request compensation of CAN$1.46 for the GM attribute, while respondents who do not trust strangers request compensation of CAN$1.81. Similarly, the WTP estimates derived from Model (3) show that respondents who do not trust the food system request compensation of CAN$3.55 for the presence of GM ingredients in a food product, whereas respondents in the most trusting group request compensation of only CAN$1.20.

Overall, the WTP estimates in Table 8 show that respondents are willing to pay a premium for canola oils with enhanced level of omega-3, but the disutility associated with the GM attribute outweighs the value that respondents place on the health benefits of omega-3. Table 8 also suggests that consumer preferences for the healthy and risky attributes associated with functional GM foods are heterogeneous. Consumers with stronger beliefs in internal control are willing to pay more for canola oil with enhanced level of omega-3 than consumers with lower levels of internal control. The WTP estimates also show that trusting consumers request less compensation for the presence of the GM ingredients than consumers who are less trusting.

6. Conclusions

This study investigates how health beliefs and trust each affect consumers' decision-making in the context of functional food choices. Incorporating both health locus of control beliefs and trust into analyses of Canadian consumers' stated choices for functional canola oils that may contain GM ingredients indicates that both have significant impacts on consumers' valuation of the healthy and risky attributes associated with a functional GM food. Trust tends to offset the negative perceptions of GM food, while respondents with a strong belief in internal control over health tend to place more value on the enhanced omega-3 content. Overall, however, comparing respondents' WTP for the attributes of canola oil products, we find that the utility loss associated with the GM attribute is greater than respondents' WTP for enhanced omega-3 content, suggesting that the marketing of functional GM food would be likely to face difficulties, although markets for enhanced omega-3 content achieved from conventional plant breeding methods have potential.

The relationships between personality traits and decision-making are of interest for many scholars in a wide range of disciplines (e.g., Davis et al., 2007; Wilson, 1971). However, among the studies of determinants of consumers' food choices, few have considered the roles of personality traits in such decisions, perhaps because of difficulties in measuring these. This study provides evidence that both locus of control and generalized trust have significant explanatory power on consumers' choices of a functional food, suggesting the importance of incorporating these personality traits

into analyses of consumer behavior. Moreover, we find that trust has stronger influences than locus of control on consumer preferences for the risky attribute (GM) of a food product, while locus of control seems to be more important in assessing the heath-promoting attribute (omega-3).

The importance of trust on decision-making under risk has been suggested by numbers of studies, but little attention, if any, has been paid to consideration of both trust and locus of control in demand analysis. This study contributes to a better understanding of consumers' food choices by shedding light on how personality traits affect consumers' valuation of healthy and risky attributes of food products. In addition, it may provide some insights for nutrition-related food policy. The finding that consumers value the health benefits of omega-3 content suggests promise of potential markets for functional food with increased levels of omega-3. However, using identified transgenic methods to enhance functional components of food is currently likely to meet considerable resistance from consumers due to a lack of trust in this technology. In a more general context, since trust tends to offset the negative perceptions of technologies that consumers view as risky, maintaining trust (trust in the food system in particular), may increase consumers' adoption of nutritious foods made with these technologies. However, use of alternative production techniques that are viewed as less risky are likely to be more acceptable to many consumers.

Table 1. Attributes and attribute levels used in the choice experiment on canola oils

Attribute	Attribute level
Omega-3 content	Contains Omega 3; Enhanced Omega 3; No label
GM ingredients	Contains GM/GE; No GM/GE; No label
Country of origin	Product of Canada; Product of US
Price	$2.50/litre; $5.00/litre; $7.50/litre

Table 2. Association between generalized trust and risk perceptions of use of GM to increase nutritional qualities of food

	High risk	Moderate risk	Slight risk	Almost no risk	Don't know
	Number of respondents (%)	Number of respondents (%)	Number of respondents (%)	Number of respondents (%)	Number of respondents (%)
Most people can be trusted	65 (15.4%)	103(24.4%)	112(26.5%)	90(21.3%)	52(12.3%)
Cannot be too careful in dealing with people	127(22%)	134(23.3%)	148(25.7%)	96(16.7%)	71(12.3%)

Table 3. Association between trust in the food system and risk perceptions of use of GM to increase nutritional qualities of food

	High risk	Moderate risk	Slight risk	Almost no risk	Don't know
	Number of respondents (%)	Number of respondents (%)	Number of respondents (%)	Number of respondents (%)	Number of respondents (%)
High trust in food system	37(13.8%)	56(20.9%)	72(26.9%)	58(21.6%)	45(16.8%)
Moderate trust in food system	113(17.8%)	155(24.4%)	172(27.1%)	120(18.9%)	74(11.7%)
Low trust in food system	44(41.1%)	26(24.3%)	19(17.8%)	9(8.4%)	9(8.4%)

Table 4. Comparison of mean scores on the internal health locus of control (IHLC) between respondents who differ in their attitudes toward food choices and health

	Food choices are important in supporting health	Food choices are not important in supporting health	T value
Mean score on the IHLC	26.37	24.28	-7.07

Table 5. Comparison of mean scores on the internal health locus of control (IHLC) between respondents who buy organic food and those who don't

	Buy organic food regularly	Never buy organic food	T value
Mean score on the IHLC	27.19	25.71	2.572

Table 6. Comparison of mean scores on the internal health locus of control (IHLC) between respondents who seek health information and those who don't

	Seek health information regularly	Seek health information occasionally	T value
Mean score on the IHLC	25.77	25.57	0.529

Table 7. Determinants of consumers' choices of functional GM/non GM canola oil

	Model (1)	Model (2)	Model (3)
Buynone	-2.0037***	-2.0218***	-2.0248***
	(0.0690)	(0.0693)	(0.0694)
Enhanced omega 3	0.3922***	0.2490***	0.2501***
	(0.0492)	(0.0740)	(0.0742)
Contains omega 3	0.4300***	0.4299***	0.4297***
	(0.0513)	(0.0516)	(0.0517)
GM	-0.8290***	-0.8326***	-1.6353***
	(0.0513)	(0.0970)	(0.1843)
Non GM	0.2709***	0.2744***	0.2759***
	(0.0479)	(0.0481)	(0.0482)
Canada	0.6574***	0.6714***	0.6702***
	(0.0385)	(0.0388)	(0.0389)
Price	-0.4548***	-0.4598***	-0.4609***
	(0.0115)	(0.0116)	(0.0116)
GM*Internal		-0.0667	-0.1115
		(0.0901)	(0.0908)
Male*GM		0.3329***	0.3472***
		(0.0854)	(0.0857)
Age*GM		-0.2012***	-0.1715***
		(0.0428)	(0.0433)
QC*GM		-0.2942***	-0.2288**
		(0.1019)	(0.1027)
Income*Enhanced omega 3		0.1550***	0.1536***
		(0.0390)	(0.0390)
Income*Contains omega 3		0.1247***	0.1232***
		(0.0412)	(0.0413)
University*GM		-0.2489**	-0.1618*
		(0.0969)	(0.0970)
Internal *Enhanced omega 3		0.2077**	0.2130***
		(0.0814)	(0.0815)
Trust in strangers *GM		0.1620*	
		(0.0941)	
Trust in food system 1*GM			1.0818***
			(0.1807)
Trust in food system 2*GM			0.8349***
			(0.1694)
Log likelihood	-5145.132	-5102.792	-5084.243
R^2	0.2144	0.2208	0.2237

***,**,*represent significance levels of 1%, 5% and 10% respectively.

Table 8. Estimates of mean willingness to pay (WTP) for the attributes of functional canola oil (in Canadian dollars per respondent) and confidence intervals

	Model (1)	Model (2)	Model(3)
Enhanced omega 3	0.86	0.99[a]	1.00[a]
	[0.75, 0.97]	[0.87, 1.11]	[0.88, 1.12]
	–	0.54[b]	0.54[b]
		[0.38, 0.70]	[0.38, 0.70]
Contains omega 3	0.95	0.93	0.93
	[0.84, 1.06]	[0.82, 1.04]	[0.82, 1.04]
GM	-1.82	-1.81[c]	-3.55[e]
	[-1.94, -1.70]	[-2.02, -1.60]	[-3.96, -3.14]
	–	-1.46[d]	-1.74[f]
		[-1.71, -1.21]	[-1.96, -1.52]
	–	–	-1.20[g]
			[-1.45, -0.95]
Non GM	0.60	0.60	0.60
	[0.49, 0.71]	[0.50, 0.70]	[0.50, 0.70]
Canada	1.45	1.46	1.45
	[1.37, 1.53]	[1.38, 1.54]	[1.37, 1.53]

[a] WTP by respondents who believe in strong internal control
[b] WTP by respondents with low internal control
[c] WTP by respondents who do not exhibit trust in strangers
[d] WTP by respondents who trust strangers
[e] WTP by respondents who exhibit least trust in the food system
[f] WTP by respondents who exhibit moderate trust in the food system
[g] WTP by respondents who exhibit most trust in the food system

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Appendix: Table A1. Definitions of variables

Variables	Definitions
Buynone	1=no purchase; 0=otherwise
Enhanced omega 3	1=enhanced omega 3; 0=otherwise
Contains omega 3	1=contains omega 3; 0=otherwise
GM	1=contains GM; 0=otherwise
NonGM	1=no GM; 0=otherwise
Canada	1=product of Canada; 0=otherwise
Male	1=male; 0=otherwise
Age	The age of a respondent (normalized)
QC	1=Quebec; 0=other regions
University	1=university degree or above; 0=otherwise
Income	Household annual income (normalized)
Internal	1 if the score on the internal health locus of control is greater than 23; 0 otherwise
Trust in strangers	1=strangers can be trusted;
	0=one can't trust strangers
	1 represents the most trusting group;
Trust in the food system 1-3	2 represents the second trusting group;
	3 represents the least trusting group