UNDERSTANDING CONSUMER ACCEPTANCE OF GENETICALLY MODIFIED FOODS IN CANADA: AN EXPLORATION OF THE INFLUENCE OF CULTURE ON CONSUMER PLANNED BEHAVIORS

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ABSTRACT

Genetically modified (GM) food is playing an increasingly important role in the global food supply chain but is still a controversial topic with consumers. This study aims to better understand consumer acceptance of GM foods and the influences of culture in Canada. More specifically, this paper investigates antecedents to consumer attitudes with respect to GM foods and how individualism and uncertainty avoidance might moderate the relationships between perceptions of risks and benefits, subjective norms, and purchase intentions.

The theoretical framework of this study is based on the Theory of Planned Behavior and Hofstede's cultural dimensions theory. Specifically, attitude, subjective norm, and perceived behavioral control are proposed as three significant predictors of consumers' purchase intention of GM foods. In addition, perceived personal benefits are hypothesized to have a stronger influence on attitude among consumers with a more individualist culture compared to consumers with a more collectivistic culture. In contrast, subjective norm is predicted to have stronger influence on purchase intention among consumers with more collectivistic culture. Moreover, perceived risks are hypothesized to have a stronger influence on attitude among consumers with higher scores on uncertainty avoidance.

This study employed a questionnaire-based consumer survey to collect quantitative information. The results indicate that consumer attitudes are influenced by perceived personal, social, and industry benefits, and risks. Further, consumers with high uncertainty avoidance place heavier emphasis on the risk factors. The integrated framework and findings of this study provide useful knowledge for both researchers and food marketers to better understand the influence of cultural values in shaping consumers' attitude and purchase intention. The results have potential implications for Canadian food and agricultural companies with respect to creating more effective strategies to communicate with consumers from diverse cultural backgrounds.

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Yufei (Bob) Huang

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1. INTRODUCTION AND STATEMENT OF OBJECTIVES

Since the first introduction of a bioengineered herbicide-resistant soybean on the market in the mid-1990s, the application of biotechnology in agriculture and food production has been viewed as a new trend in both the food industry and global food supply chain (Chen & Li, 2007). While such genetically modified (GM) crops and food products are designed to provide significant benefits to farmers and food manufacturers on the production side, public attitudes and consumer acceptance toward GM foods are still highly controversial topics on the marketing side (Hossain et al., 2003). The World Health Organization (World Health Organization [WHO], n.d.) defines GMOs as "organisms in which the genetic material has been altered in a way that does not occur naturally by mating or natural recombination" (para. 1). Genetic modification usually involves changing the genetic makeup of the organism to create new or enhanced traits (Zhang et al., 2016). GM crops are favorable for the agriculture industry due to the introduction of specific traits that benefit farming and product processing, such as herbicide tolerance, insect resistance, and enhanced yield. Therefore, GM technology helps farmers and food manufacturers to reduce average production costs and increase overall productivity (Maghari & Ardekani, 2011). In addition, the adoption of GM crops is believed to be a practical solution to meet the anticipated increasing worldwide demand for food during the next few decades, which also creates a vast potential market for the industry (Guehlstorf, 2008). As a result, it is not surprising to find that more than 90% of the corn, cotton, and soybeans grown in the United States (US) are GM-based (USDA-ERS, 2017). In Canada, another major international food supplier, biotechnology also plays a vital role in supporting agricultural and food production (Danielson & Watters, 2017), with the adoption of GM-based corn and canola at over 95% (Smyth, 2014).

Compared to the successful adaptation of GM technology in industry, consumer acceptance of GM foods has been an area of considerable controversy. Scholars have invested considerable efforts investigating consumers' perceptions and evaluations of GM foods. Hess et al. (2016) reviewed 214 journal articles and government reports published between 1991 and 2012, and report that prior studies placed strong emphasis on delineating the relationships among perceptions, attitudes, purchase intentions, and willingness to pay. Costa-Font et al. (2008) also argue that

consumers' attitudes toward GM foods is one of the major factors influencing their intentions to purchase GM foods. Moreover, Costa-Font et al. (2008) highlight the essential role of perceptions of benefits and risks on the formation of consumers' attitudes toward GM foods. Research has shown that a large group of consumers holds an overall negative attitude towards eating GM foods because they perceive more risks than direct benefits (Costa-Font et al., 2008). From the consumers' perspective, the risks of eating GM foods include potential health impacts, potential environmental impacts, social concerns, and ethical concerns (Hossain & Onyango, 2004; Zhang et al., 2016). In addition, previous studies also suggest that consumers' attitudes toward GM foods vary across countries and geographic regions. For example, consumers from most European Union (EU) countries reject GM foods while US consumers have relatively neutral opinions about consuming GM foods under certain conditions (Colson et al., 2011; Gaskell et al., 2010; Rojas-Mendez et al., 2012). According to survey results reported by Gaskell et al. (2010), the rejection of GM foods and biotechnology in several EU countries indicates public concerns about using this new technology without substantial scientific evidence and regulations from the government. In Canada, a recent consumer survey supported by Health Canada indicates that 61% of respondents had a negative impression of GM foods (Gregg et al., 2016). In China, public attitudes about GM foods have experienced a dramatic change from generally positive to negative with increasing awareness of GM technology (Ho et al., 2006; Li et al., 2002). An earlier study suggests Chinese consumers, having limited knowledge of GM technology, have higher acceptance of GM foods compared to other countries (Huang et al., 2006). However, a recent study found that Chinese consumers have less intention to buy GM foods than US consumers due to more serious concerns about the safety of the product (Yang, 2013). Overall, the above results show that consumer acceptance of GM foods varies across countries and geographic regions in the world and that public attitudes about GM food can be changed within a specific country. Costa-Font et al. (2008) established a conceptual framework and suggest cross-country differences in consumers' attitudes about GM foods are potentially influenced by two major factors: consumers' perceptions of benefits and risks and consumers' individual values. In a later study, Costa-Font and Gil (2009) report that the variations in consumers' attitudes about GM foods in three EU countries (Spain, Italy and Greece) are associated with different correlations between consumers' attitude and benefit and risk perceptions. They suggest, based on their findings, that culture plays a role in an individual's decision-making process, which shows the importance of establishing cultural-specific

strategies in communications with consumers; however, they did not explain the specific role of cultural values in the process. Based on the findings of Costa-Font et al. (2008) and Costa-Font & Gil (2009), we believe we can fill a potential theoretical gap by testing the potential role of cultural values in predicting consumers' purchase decision-making with respect to GM foods.

Food choice is a complicated decision-making process influenced by several determinants related to value perceptions in terms of both product factors (e.g., taste, appearance, and safety of food products) and non-product factors (e.g., cognitive information, physical, environmental, and social factors) (Grunert, 2002, 2005). In addition to perceptions of quality and safety based on product attributes, scholars suggest that individuals' food choices and eating behaviors are also determined by social influences, including cultural values (Higgs & Thomas, 2016; Nestle et al., 1998). Culture is defined as a set of values and beliefs shared by a group of people. Following this definition, the influence of culture on consumers' choices can be explained together with the value concept (De Mooij, 2015). Culture relates to both social and individual value systems that help people choose between alternatives. Shared values can be found in different cultures, but priorities vary (De Mooij, 2015). Cultural values not only tell consumers what values are more important than others from food attributes but also set specific norms for consumers to decide what foods are proper to eat and what should be avoided (Higgs & Thomas, 2016; Nestle et al., 1998). For example, consumers have established a clear relationship between food choices and health, with healthy eating becoming a new cultural norm in recent years (Nordstrom et al., 2013). As a result, consumers are experiencing a significant transition from energy-dense (e.g., high protein, high fat, and high carbohydrates) food choices to more nutritionally balanced food options (Kearney, 2010). Following the line of this discussion, we believe that specific consumers' cultural values could be considered as a new potential component to add to a widely used conceptual model of understanding consumer attitudes and purchase intention with respect to GM food.

As an initial stage of exploring consumer acceptance of GM food, many prior survey-based studies applied the one-layer framework of random utility theory to identify the essential factors associated with consumers' choice, attitude, and willingness to pay for GM foods. For instance, Chen and Chern (2002) found that consumer acceptance of GM foods was determined by factors including perceived benefits and risks, ideas about GM labelling, environmental impacts, and perceived difference between GM and non-GM products. In addition, Burton et al. (2001) suggest

that consumer acceptance of GM food is also determined by whether the new gene is transferred within the same species or cross-species. Given these previously identified predictors, more recent studies have examined consumer acceptance of GM food using a more complex, multi-layered behavioral model to extend the understanding of consumer behaviors (Hess et al., 2016). The Theory of Planned Behavior (TPB) model is one of the most widely applied models for understanding consumer behavior (Ajzen, 1991). It indicates that consumers' behavioral intention can be predicted by attitude, subjective norms, and perceived behavioral control. The TPB model has been commonly applied to predict food choices and eating behaviors (Ajzen, 2015a; McDermott et al., 2015). It is also a popular theoretical tool in previous studies regarding consumers' GM food acceptance and attitudes (Bredahl, 2001; Chen, 2008; Cook et al., 2002; Prati et al., 2012; Spence & Townsend, 2006). In addition to its popularity, I chose the TPB model because it is a developing model that can still be extended by additional variables (Ajzen, 2015a, 2015b). For example, Ajzen (2015a, 2017) suggests that a group of background factors including culture can be added to the original TPB model to better predict consumers' food consumption. In previous studies of GM food behaviors, the TPB model was not only amenable to new predictors (e.g., self-identity) of behavioral intention but also suitable for the testing of potential moderators (e.g., food technology neophobia) of relationships of interest between variables (Kim et al., 2014). Also, we take behavioral intention from the model as our dependent variable because actual behaviors with respect to GM food might be hard for consumers to identify without the presence of mandatory GM labeling in Canada. Therefore, we believe that the TPB model is a practical tool to understand consumer acceptance of GM food in Canada while also allowing us to explore the potential moderating effects of cultural values within the process. To measure individual cultural differences, Hofstede's (1983, 1984, 2005) dimensions of culture were applied. Two of the total of six dimensions (individualism and uncertainty avoidance) were included in the integrated framework of the study. The effectiveness of Hofstede's cultural dimensions is widely supported by many cross-cultural and international marketing studies (Soares et al., 2007). Although more commonly applied to measure cultural differences at the country level, some researchers argue it is possible to use these national-level cultural value dimensions for individual-level measurements (Taras et al., 2010). Despite the ongoing argument about applying Hofstede's cultural dimensions at the individual level, as reviewed by De Mooij (2015), this work aligns with Taras et al. (2010) and applies Hofstede's cultural dimensions to measure individual cultural values of Canadian

consumers. The rationale for choosing individualism and uncertainty avoidance will be discussed later.

In summary, prior studies have intensively investigated consumer attitudes, intention to purchase, and willingness to pay for GM foods to better understand consumer acceptance of GM foods (Hess et al., 2016). Several factors have been established as influential factors, including benefits and risk perceptions, product price, trust, knowledge of product, and personal attributes (Costa-Font et al., 2008). Current literature suggests the potential for cultural influences in consumers' decision-making with respect to GM foods. What is not clear, however, is the specific role of cultural values in determining an individual's behavioral intentions with respect to GM foods. Culture is an inclusive construct that potentially encompasses diverse elements, including language, religion, food consumption habits, etc. Canada has a multicultural society, and therefore each Candian consumer is not only a person with unique individual values and attributes but also a member of a number of specific cultural communities. In this study, we aimed to answer the following research question: "What cultural dimensions influence which relationships in the decision-making process with respect to GM food?". The potential implications of the findings include providing empirical evidence to explore the specific role of individual cultural values in consumers' decision-making processes and informing marketers about the importance of applying culturally specific communication and segmentation strategies in operation. As suggested by an official report from Health Canada (Gregg et al., 2016), communication is still a critical challenge for both GM food industries and regulators to address the challenge of consumer acceptance. We believe that the notion of consumers' different cultural backgrounds is a useful tool to identify the core barriers to communication about GM food with consumers. This would improve industry performance by identifying the correct audience for marketing information based on cultural values.

To address the research question, the first objective of this study is to apply the TPB model (Ajzen, 1991) to investigate consumer attitude formation and change in the context of accepting GM foods. The second objective is to examine how two cultural dimensions (Hofstede, 1983, 1984, 2005) influence consumer attitudes and modify the relationships in the planned behavioral framework. It is critical for marketers to recognize that the marketing strategies and means of communication should be different when targeting consumers with different cultural values. This

study takes a two-step approach. The first step is a pilot study, with university students as survey participants. The primary purposes of this pilot study are to validate the planned behavior framework, test the measurement scales, and inform potential revisions and modifications of the research instruments. The second phase of the research features an online consumer survey in Canada. The primary purposes of this online survey include validating the theoretical model and testing the hypothesized relationships.

2. LITERATURE REVIEW

2.1 Current state of consumer acceptance of GM foods

Previous studies have investigated consumers' attitudes and preferences regarding GM technology and GM foods. Although some early studies show that consumers around the world have relatively negative attitudes toward GM foods and applying GM technology in agricultural and food industries, a recent review on consumer evaluation of GM foods provides new evidence on the continuous changes of consumers' attitudes and perception of GM foods (Costa-Font et al., 2008; Hess et al., 2016). Indeed, findings from the Eurobarometer reveal that most European countries experienced a significant drop regarding the total percentage of GM food supporters from 1996 to 2010 (Gaskell et al., 2010). Consumers from three major EU countries—France, Germany, and Italy—shared the same negative general attitudes and purchase intentions with respect to GM foods (Gaskell et al., 2010; Rojas-Mendez et al., 2012). Maghari and Ardekani (2011) argue that consumers have major concerns about eating GM foods because the technology might have some long-term health risks and other types of unknown impacts. However, after a meta-analysis of 214 different studies, Hess et al. (2016) argue that the overall negative attitudes and rejections towards GM foods within European consumers might have been exaggerated by the overestimation of risks and uncertainties due to the types of questions being asked. They also indicate that consumer evaluations of GM foods are influenced by several shared factors such as perceived benefits and risks from the product and technology, while the magnitude and significance of these factors can differ among consumers across countries. Costa-Font and Gil (2009) also found similar results in an earlier study conducted in four EU countries.

The US has more than 15 years of history and experience producing and applying commercial GM foods. Therefore, US consumers are potentially more familiar and accepting of GM foods compared to European counterparts. However, the real situation is complicated. Gaskell et al. (1999) found that the US consumers were more supportive of the application of GM crops and foods than the European consumers. At the same time, several previous studies also found the negative attitudes and rejection toward GM foods in the US. For example, Moon and Balasubramanian (2003) report that US consumers are willing to pay a premium (10-12%) to *avoid*

eating GM foods although the premium is less than for UK consumers (19-35%). Onyango and Govindasamy (2004) also found that US students still prefer non-GM food products with respect to chips, banana, corn flakes, and ground beef. They also note the significant and positive perceived product benefits had a significant improving effect on consumer choice towards GM food. Their findings indicate changing US consumer attitudes toward buying GM food is possible if they perceive some direct benefits from GM products. The same result is also found in another study where US consumers were more accepting of GM products and GM technology if they found additional related values or benefits (Hossain et al., 2003). A recent consumer survey in the US supports the idea that US consumers are more sensitive to clear product benefits acquired from GM products, in that they have more motivation to buy processed GM foods with direct health benefits (e.g., enhanced nutritional facts) than conventional farm-focused GM products (Lusk et al., 2015). While risk perceptions are still essential factors influencing consumer acceptance of GM foods in the US, all of the above studies seem to suggest that some US consumers are more open to GM products in consideration of potential consumer benefits.

As one of the fast-growing food producers and exporters worldwide, the overall situation of the commercialization of GM food in Canada is very similar to the US; however, Canadian consumers might have a more stable negative attitude towards eating GM foods. In fact, the official report confirms biotechnology plays an essential role in the Canadian agricultural and food industries (Agriculture and Agri-Food Canada [AAFC], 2016). Although less attention has been paid to deeply understanding consumers' attitudes and acceptance to GM food in Canada, results from several consumer surveys do show negative attitudes toward the consumption of GM foods. One survey shows that about 63% of consumers do not want to buy food either made from GM materials or containing GM ingredients (Manitoba Consumer Monitor [MCM], 2016). This number is somewhat consistent with data from a national survey that indicate 61% of participants have mostly negative impressions of GM foods (Gregg et al., 2016). On the other hand, the survey (MCM, 2016) also suggests more than 40% of consumers still have different levels of acceptance of GM food after being offered value-enhanced GM food products. This indicates a potential positive impact of direct benefits on consumer acceptance of GM food, as found in the US. This almost mirrors results from a previous study on consumer choice among GM food, organic food, and regular food, which found Canadian consumers prefer regular food (non-GM) over GM food; yet, some acceptance does exist (Larue et al., 2004). Based on the above discussion, consumer

attitudes toward GM foods appear to be complex. Although many people reject buying GM foods due to concerns about safety (perception of risks and uncertainty), still other consumers are willing to purchase GM foods due to the potential positive benefits.

China is a major international food market due to its large population. Furthermore, due to the rapidly increasing number of middle-class families, China's need for food imports is expected to continue to increase until at least 2020 (Zhou et al., 2012). Several important agricultural products, such as soybeans and corn, are highly GM based in the US and Canada, and some have been imported by Chinese food producers in recent years. According to Ho et al. (2006), some local companies in the Chinese agricultural industry are interested in using more GM-based species for better production efficiency. Initially, China pursued relatively aggressive policies for biotechnology development but, in recent years, the central government has become more sensitive to the potential environmental risks of transgenic food crops. Although data from China are still lacking, Ho et al.'s (2006) findings indicate that Chinese consumers have gradually increased their knowledge and awareness of GM foods and ingredients. Specifically, their general attitudes toward consumption of GM products have evolved over time and become more negative. At the time of the study, about 60% of participants were unwilling to purchase GM foods while only a few had enough knowledge about the topic "Genetically Modification" (Ho et al., 2006). Another study, based on a survey conducted in 11 major cities in China, suggests that Chinese consumers tend to have much higher acceptance compared to consumers in other countries, although their knowledge about GM foods is limited (Huang et al., 2006).

It appears that Chinese consumers are experiencing a downward trend in terms of willingness to buy GM foods as they learn more about the technology. In fact, studies done in major Chinese cities show that some consumers are willing to pay a premium (from 20 to 38%, depending on city and product category) for GM-free products while others changed their mind based on price benefits (Li et al., 2002). These results are similar to those found in the US and European countries.

Overall, consumers have diverging attitudes towards GM foods. While a large segment of consumers have negative attitudes toward GM foods, a smaller segment are willing to consider purchasing GM foods.

2.2 Current state of regulatory environments with respect to GM foods

The regulation of genetic engineering technology and GM food products varies widely between countries. Each country has specific regulatory agencies to assess and manage the risks and issues related to using genetic engineering in the agricultural and food industries. One shared objective in building these regulatory frameworks is to ensure food safety not only for foods produced domestically but also for foods imported from other countries. Despite a scientific consensus that currently approved food products made from GMOs do not pose greater health risks for human consumption than conventional foods, regulations in most countries still suggest the need to do safety assesment on a case-by-case basis (Domingo & Bordonaba, 2011). However, the concepts and approaches to achieving regulatory goals are very different among countries. Labeling of GM food products in the marketplace is a critical issue for the regulation of GM foods as well as a specific way to demonstrate the differences in regulatory environments among countries (Gruere & Rao, 2007). The following section provides more detail about the regulators, concepts, and labeling policies with respect to managing GM food products in the US, Canada, the EU, and China.

As two of the early adopters of genetic engineering technologies and major GM crops producers in the world, the US and Canada both have about 20 years of regulation experience with respect to managing GM foods and share some similar concepts and knowledge in this area (Smyth, 2014). For example, safety and risk assessments in the US and Canada follow from scientific evidence that shows GM foods are generally recognized as equally safe as conventional foods (Domingo & Bordonaba, 2011; Food and Drug Administration [FDA], 2017; Health Canada, 2017). In the United States, the United States Department of Agriculture (USDA), United States Food and Drug Administration (USFDA), and United States Environmental Protection Agency (USEPA) are three major regulators of conventional food and agricultural production. They are also responsible for the approval of GM crops and GM foods products under the *Coordinated Framework for Regulation of Biotechnology* (FDA, 2017). Based on this official regulatory framework, the US regulations focus on the final product but not the process of production. Canada follows a similar process with three government agencies—the Canada Food Inspection Agency (CFIA), Health Canada, and Environment Canada—working together to regulate GM-based foods (Health Canada, 2017). In addition, the regulation of GM foods (called novel foods) in Canada is based on the existing framework for conventional foods (Health Canada, 2017). Similar to the US,

Canada's approach to doing assessments also focuses on the product itself rather than the process. Labeling of GM foods is currently voluntary in the US and Canada (Gruere & Rao, 2007; Smyth, 2014). The current regulations for GM foods in the US and Canada appear to reflect cautious-optimistic attitudes towards genetic engineering technology and GM products by the respective governments, and provide a favorable regulatory environment for the adoption of GM foods and related biotechnologies.

In contrast, political gatekeepers in the EU and China are more cautious about accepting genetic engineering technology in the food industry. Consequently, GM food regulations in these two regions not only focus on the safety of the final GM products but also on the application of GM technology in the process of production (Gruere & Rao, 2007). Therefore, unlike the US and Canada where the regulations call for voluntary labelling with respect to the presence of GM-based ingredients in the final products, regulations in the EU and China demand mandatory labelling for products that either contain GM ingredients or have employed GM technology in the production process (Gruere & Rao, 2007).

In the EU, GM foods are regulated at two levels. First, the European Food Safety Authority issued harmonized rules on GMOs from the European Commission (EC). Second, regulations exist for each EU member country. This means that any GM-based foods sold in EU countries must be approved by the target nation first, and then the company must apply for approval through the EC as well (Gruere & Rao, 2007). In the updated *Food Safety Law* of 2015, Chinese food safety regulators set up mandatory requirements for labeling of GM foods (Wong & Chan, 2016). Given the fact that food safety and security are two critical issues in China, the increased productivity and potential risks of adopting GM technology are equally important to Chinese regulators. In fact, the Chinese government has provided continuous support for the development of biotechnology and its application in agricultural production. The regulatory framework in China also focuses on the management of potential risks and issues associated with GM foods (Wong & Chan, 2016).

2.3 New generation of GM foods and consumer acceptance cross countries

The primary objectives of GM technology focus on solving the major problems of agricultural and food production. Accordingly, the first generation of GM crops and foods was designed in terms of specific attributes such as increased yield and productivity. Resistance to herbicide and insects are two of the most popular properties to help farmers and food producers cut

their unit costs (Maghari & Ardekani, 2011). It has been argued that some recently developed GM-based crops offer better performance in terms of disease prevention and environmental adaptation, which are very practical for the agricultural and food industries (Zhang et al., 2016). However, because the first generation of GM foods focused on producer-oriented benefits, consumers found it difficult to understand and perceive direct benefits to them when comparing GM foods with alternative food choices, such as organic foods and regular non-GM foods. Although no substantial scientific evidence indicates negative health impacts from eating GM foods, consumers still have concerns about GM food consuption, including safety (e.g., food allergies), environmental risks (e.g., issue of "superweeds"), and ethical problems (e.g., changes to nature) (Bawa & Anilakumar, 2013; Maghari & Ardekani, 2011).

To solve the problems associated with current GM foods, a new generation of GM food products has been introduced to potentially enhance consumer acceptance of GM foods by incorporating more direct benefits for consumers. Consumers expect foods to be safe, health-promoting, convenient, and, ideally, environmentally friendly (Grunert, 2005). In fact, the perception of product attributes related to safety and quality plays a vital role in influencing consumers' food choice. Consumers have become aware of the relationship between food choices (e.g., consumption of soft drinks) and health outcomes (Frewer et al., 2003). Resulting from the healthy diet trend, consumers tend to have more positive attitudes toward products with more health claims and nutritional information compared to regular products (Kozup et al., 2003). Accordingly, the new generation of GM foods with an enhanced level of functional nutrients (e.g., vitamins, minerals, and antioxidants) are designed to meet the new trend of consumers' needs. More importantly, consumers are expected to hold a more positive attitude and purchase intention towards this value-added type of GM food if they perceive health benefits, especially when the perceived benefits outweigh the perceived risks (Costa-Font et al., 2008). One example of the new generation of GM crops with specific enhanced nutrients is Golden Rice. Golden Rice is a specific type of rice created through genetic engineering to provide additional beta-carotene (the precursor of vitamin A), which is important for eye health (Ye et al., 2000). More importantly, this GM-based Golden Rice is also expected to be a cost-effective solution to address vitamin A deficiency in developing Asian countries (Zimmermann & Qaim, 2004). Therefore, the benefits of buying such GM foods occur not only at the individual level but also at the group or social level. However, previous studies suggest that consumers from different countries and regions have different

perceptions and opinions towards the new generation of GM foods with enhanced nutritional content and health benefits. Consumers from EU countries tend to maintain their negative attitudes towards the new generation of GM foods even when presented with several clear health benefits. A study with German consumers found they are reluctant to accept most of the extra health benefits and still willing to avoid GM foods. Most German consumers have clear negative attitudes with respect to applying biotechnology to produce food and greatly prefer traditionally grown foods (Rojas-Méndez et al., 2012). Hossain et al. (2003) report that the consumer acceptance of GM foods in the US is positively influenced by the perception of several tangible benefits, such as vitamin enhancement and lower price; for example, about 80% of participants had positive attitudes towards vitamin A fortified rice. A similar result from another study with US consumers shows a specific group of individuals is willing to pay more for GM products labeled as nutrient enhanced (Colson & Huffman, 2011). In a consumer survey on the acceptance of nutrient-enhanced GM orange juice, more than 76% of consumers were more likely to buy the GM2 product compared to the original product (Hossain & Onyango, 2004). Based on the discussion of these studies, additional health benefits embedded in GM2 foods are expected to have a positive impact on consumer attitudes and purchase intentions.

Moreover, consumer attitudes towards GM foods might be influenced by their culture and values. Studies have detected potential regional variations in consumer attitudes toward GM foods (Costa-Font & Gil, 2009; Nayga et al., 2006). In this study, we are particularly interested in investigating how cultural values moderate the relationships among the various factors that affect attitude formation. In addition to the fact that Canada is a multicultural society where diversity exists among domestic consumers, the Canadian agri-food industry exported $56 billion of products in 2016, accounting for about half of all industry outputs (AAFC, 2017). China is a priority export market for the Canadian agriculture industry (Canadian Agri-Food Policy Institute [CAPI], 2015). The substantial and increasing need for oil seeds and processed foods have resulted in considerable growth in exports to China in recent years (AAFC, 2016). However, as the CAPI (2015) report pointed out, the Chinese market and Chinese consumers are still very new to most Canadian companies. There is an urgent need to understand international consumers and their unique cultural values (CAPI, 2015). Such understanding of how different cultural values influence consumer acceptance of GM foods would provide information to help the Canadian industry improve future marketing strategies in the global market.

3. DEVELOPMENT OF FRAMEWORK AND HYPOTHESES

3.1 Consumer acceptance of GM foods and the Theory of Planned Behavior

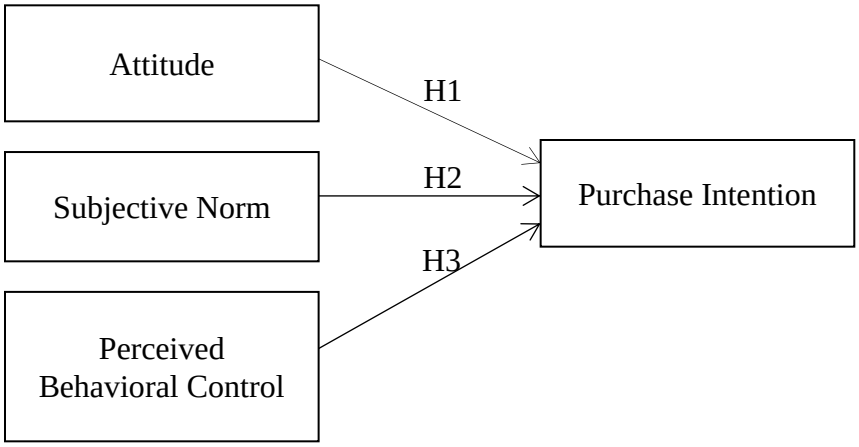
Consumers' food choice is an interesting domain of consumer behavior. Consumers must make their own decisions about different food options during their daily shopping. To better understand an individual's behavior and decision-making, social and psychological scientists have created several models to explain the relationship between behavioral intention and actual behavior (Fishbein & Ajzen 1975; Ajzen, 1991). Fishbein and Ajzen (1975) define behavioral intention as "… a person's location on a subjective probability dimension involving a relation between himself and some action" (p. 288). Accordingly, attitude and subjective norm are applied as two factors to predict a person's intention to engage in a certain behavior in the model of the Theory of Reasoned Action (TRA; Fishbein & Ajzen, 1975). Although a consumer's actual behavior is arguably not always well predicted by consumer attitude, this model has received support from subsequent behavioral studies and is frequently applied in consumer behavior research (Chen, 2008). The Theory of Planned Behavior (TPB) model developed by Ajzen (1991) is an extension of the TRA model, adding perceived behavioral control as a third antecedent to explain behavioral intention and actual behaviors. Specifically, the TPB model introduces a new concept: individuals are more likely to pursue a certain behavior if they believe they can do it successfully. The TPB model has been successfully applied in different consumer behavioral studies and further adapted to many other sub-contexts of consumer choice decision-making research, such as consumer choice on E-commerce service and food (Pavlou & Fygenson, 2006; Lobb et al., 2007). Consumer acceptance of GM foods is a specific context to adapt the TPB model for better understanding of consumer behavior within food marketing.

Based on the TPB model (See Figure 3.1), a consumer's purchase intention with respect to specific food products, such as GM foods, is determined by three factors:

- the attitude that this consumer holds toward GM foods (Attitude);
- the degree of social pressure that this consumer perceives from other related people about purchasing GM foods (Subjective Norm); and

- the degree of control that the consumer feels he or she has over the purchasing of GM foods (Perceived Behavioral Control) (Ajzen, 1991; Chen, 2008).

Figure 3.1 Factors influencing consumer purchase intention with respect to GM foods (adapted from Ajzen, 1991)



Several studies indicate the value of this conceptual model for predicting consumer acceptance of GM food. According to the results of a survey in the UK, Spence and Townsend (2006) found all three components of the TPB model are significant predictors of consumer intention to buy GM foods. In addition, other studies extend the classic TPB model with different potential factors associated with major components in the context of consumer acceptance of GM foods, with some of these new factors supported by experimental evidence. For instance, Cook et al. (2002) indicate that self-identity can be added into the TPB model as an additional predictor (while the other three are still effective) to understand consumer purchase intention with respect to GM foods, and is therefore also related to the actual purchasing behavior of GM food. Other factors such as attitudes to science and GM technology as well as trust in experts (scientists) and regulators (government) have also been studied via adaptations of the TPB model (Costa-Font & Gil, 2009). Accordingly, we hypothesize that all three determinants from the original TPB model are significant predictors of consumers' purchase intention of GM foods in the current study.

3.1.1 Attitude

Within the three constructs from the original TBP model, attitude has been consistently confirmed as the most significant predictor of purchase intention of GM foods by several previous studies (Cook et al., 2002; Prati et al., 2012; Spence & Townsend, 2006). According to the original TPB model (Ajzen, 1991, 2002a), more favorable attitudes toward a behavior should lead to a higher intention to perform that behavior. The same conclusion is supported by studies on consumer acceptance of GM foods conducted in different countries and regions (Chen & Li, 2007; Rodriguez-Entrena et al., 2013). Similar to these previous studies, we hypothesize that:

H1: A positive attitude towards GM food will have a positive influence on purchase intention.

3.1.2 Subjective norm

As per Ajzen's (2002a) description, the subjective norm is a determinant of behavioral intention associated with beliefs about normative expectations of others and motivation to comply with these expectations. It reflects an individual's perception that people important to them believe they should do such a behavior (Ajzen, 1991; Ruiz-Mafe et al., 2016). It suggests that food choices by consumers must consider the preferences and responses of others. Consideration of the acceptance of others is heightened when the consumer is responsible for preparing food for the entire family (MCM, 2016). Similarly, purchase decision-making with respect to GM foods can also be influenced by the opinions and attitudes of others. For example, the food shopper in the family might be willing to buy GM foods for a given reason (e.g., extra health benefits and lower price) but might eventually choose other options in the market because other family members do not want to try GM foods. Moreover, the influence of subjective norm on consumer intention to buy GM foods goes beyond family members and friends; the influence can be from a person's social circle or other consumers and opinion leaders in the marketplace. Consumers might change their decision regarding purchasing GM foods because they hear the news that other consumers are trying to avoid GM products. Although the significant relationship between subjective norm and purchase intention of GM foods is confirmed by previous studies (Cook et al., 2002; Spence & Townsend, 2006), the conclusions of other studies conducted in different countries are less consistent (Prati et al., 2012). For instance, Spence and Townsend (2006) found that subjective norm is positively associated with purchase intention for consumers from the UK. On the contrary,

the conclusion is not fully supported by the findings from another study done in Italy (Prati et al., 2012). One possible reason for this variation relates to the items and scales of measuring (Spence & Townsend, 2006). In line with Spence and Townsend (2006), we hypothesize a potential positive relationship between subjective norm and purchase intention of GM foods among Canadian consumers:

H2: A perceived positive subjective norm of GM food consumption will have a positive influence on purchase intention.

3.1.3 Perceived behavioral control

Perceived behavioral control (PBC) is a person's perception of how easy or difficult it would be to carry out a behavior (Ajzen, 1991). Ajzen (2002a; 2002b) also suggests that planned behavior control should be measured as perceived control over the performance of a behavior. In the original model of the theory of planned behavior, PBC plays two roles. First, it is the third co-determinant along with attitude and subjective norm that together predict behavioral intention. Second, it is a co-determinant together with behavioral intention of the actual behavior (Ajzen, 2002b). According to the initial concept of Ajzen (1991), people who perceive more control are expected to be more likely to perform the behavior. In the context of GM food consumption, one way to describe PBC is a consumer's perceived ability to choose whether or not to purchase GM foods (Prati et al., 2012; Spence & Townsend, 2006). In the context of GM foods, prior studies report mixed results predicting the relationship between PBC and purchase intention (Cook et al., 2002; Spence & Townsend, 2006). PBC is unique from the other two factors in exploring the intention to buy GM food; some studies focus on the control of avoiding GM foods while others concentrate on control of purchasing. In this study, we are more interested in the perceived difficulty for consumers to make choices over purchase or avoidance of GM foods. Based on the initial concept of Ajzen (1991), we propose the following hypothesis:

H3: A perceived positive behavioral control with respect to GM food consumption will have a positive influence on purchase intention

3.2 Perceived benefits, risks and the construction of consumer attitude

Researchers have done a number of studies to explore the formation of consumers' attitudes towards GM foods. One of the most conventional theories regarding the formation of consumer attitudes is the Fishbein Multi-attribute Model (Fishbein, 1963). This model indicates that consumer attitudes toward a specific product are a function of their beliefs about the product and the evaluation of product attributes (Fishbein, 1963; Costa-Font et al., 2008). Based on Fishbein's (1963) Multi-attribute Model, Bredahl (2001) developed a new framework that suggests consumer attitudes toward GM foods are determined by the perception of benefits and risks of using GM technology to produce food products. According to Bredahl's (2001) study among four EU countries (Denmark, Germany, Great Britain, and Italy), perceived benefit has a strong positive influence on overall attitude towards GM foods. In contrast, perceived risk has a negative impact on consumer attitude in all counties. Similar conclusions are found in several other research studies conducted in different countries or regions (Costa-Font & Gil, 2009; Curtis and Moeltner, 2006; Moon et al., 2007; Rodríguez-Entrena et al., 2013). In other words, these studies indicate that consumers form attitudes toward GM foods by an overall weighted evaluation of both positive and negative effects of the product attributes. From this perspective, personal benefits, industry benefits, and social benefits are believed to be the three major aspects of attribute-related benefits of GM foods that can potentially be perceived by consumers. On the other hand, consumers' perceptions of the risks of applying GM technology and eating GM foods are associated with several concerns about the uncertainty within three areas: health, ecology, and ethics.

3.2.1 Perceived personal benefits

Of all the different types of potential benefits of GM foods, direct personal benefits might be one of the most fundamental considerations for consumers to start the evaluation. However, as mentioned above, there is a strong rationale for consumers to think about why GM food is an excellent choice for themselves and their families but the information about the clear benefits of the current GM food products is still highly limited (Gregg et al., 2016). The value of providing more direct benefits to consumers is supported by several previous studies (Gonzalez et al., 2009; Knight, 2005; Rojas-Mendez et al., 2012; Zhang et al., in press). Current genetic engineering techniques allow modification of crop traits such as yield, chemical composition, and stress resistance (e.g., insect resistance). Therefore, price discount, enhanced nutritional value, and less

use of chemicals (e.g., pesticides) have now become possible personal benefits to consumers choosing GM foods (Zhang et al., 2016; Hossain & Onyango, 2004). GM products biofortified with specific micronutrients is applied in previous studies to explore the influence of such consumer benefits on attitudes (Onyango & Jr. Nayga, 2004). According to Gonzalez et al. (2009), about 75% of respondents in Brazil support the introduction of a GM-based pro-vitamin A cassava. In addition to the possible nutritional benefits of GM foods, some consumers believe the most import benefit from eating GM foods is to reduce chemical usage. Chen and Chern (2002) report that consumers who perceived such safety benefits of GM food will have positive attitudes toward certain GM foods. Based on the above discussion, we hypothesize that:

H4: Perceived personal benefits of GM food consumption will have a positive influence on attitudes.

3.2.3 Perceived industry benefits

The industrial benefits of producing GM food are easier for consumers to understand because they form the strong motivation for applying GM technology in the food and agricultural industries. According to a Health Canada consumer report (Gregg et al., 2016), participants can identify several practical benefits of GM foods, including "higher yields, shorter growing season, and ability to grow crops under harsh conditions…." (p. 27). This suggests consumers might not fully perceive the personal benefits of GM foods, but have some understanding of the benefits of GM foods and technology to the industry. Results from a Health Canada consumer report (Gregg et al., 2016) and a review from Hess et al. (2016) suggest perceived industry-related benefits of GM foods results in a mixed influence on consumer perceptions of GM foods. Some consumers might pay more attention to individual benefits of food choices, but the benefits of GM foods are not limited to the individual level but also occur at the group level. From an economic perspective, for instance, James (2013) indicates that GM crops typically offer an approximately 42% financial gain to the agricultural industry due to increased yield and resistance to pests and weeds. In Canada, the Agriculture and Agri-Food System has played an increasingly important role in the national economy in terms of economic performance and employment (AAFC, 2016). In other words, it is highly possible that Canadian consumers are sharing the industry benefits of producing GM corps within the system. Therefore, it is interesting to determine if consumers in Canada would consider

industry benefits positively in the process of attitude formation. Consequently, we made the following hypothesis:

H5: Perceived industry benefits of GM food consumption will have a positive influence on attitudes.

3.2.3 Perceived social benefits

Social benefits of GM foods are usually associated with the potential issues of global food security due to population increase. Although the average growth rate of the world population has gradually slowed in the past few years, the global population is projected to reach 9.7 billion by 2050 (The United Nations Department of Economic and Social Affairs [UN DESA], 2015). This population increase introduces significant challenges to the global food supply chain. According to data from the Food and Agriculture Organization of the United Nations (FAO, n.d.a), the number of undernourished people increased from 777 million to 815 million from 2015 to 2016. Population increase also results in a decrease in arable land for agriculture production per person (FAO, n.d.b). Therefore, the significant advantages of GM crops, such as increased yield and disease resistance, are critical for both the industry and government to ensure the stability of the food supply chain. Moreover, GM crops are also noted as an effective solution to reduce the environmental stress from agricultural production due to their insect resistance (Bawa & Anilakumar, 2013).

Compared to the direct personal benefits and industry benefits of GM foods, the social benefits of GM foods with respect to food security and environmental protection might be more obvious and much easier for most consumers to understand, even without extra knowledge. Many previous studies (Hess et al., 2016) asked questions about the social benefits (e.g., food supply and environmental benefits) of GM foods to measure consumers' benefit perception. The results of these studies show positive impacts of perceived (social) benefits on attitudes towards GM foods (Chen & Li, 2007; Prati et al., 2012; Spence & Townsend, 2006). Following from these studies, we hypothesized that:

H6: Perceived social benefits of GM food consumption will have a positive influence on attitudes.

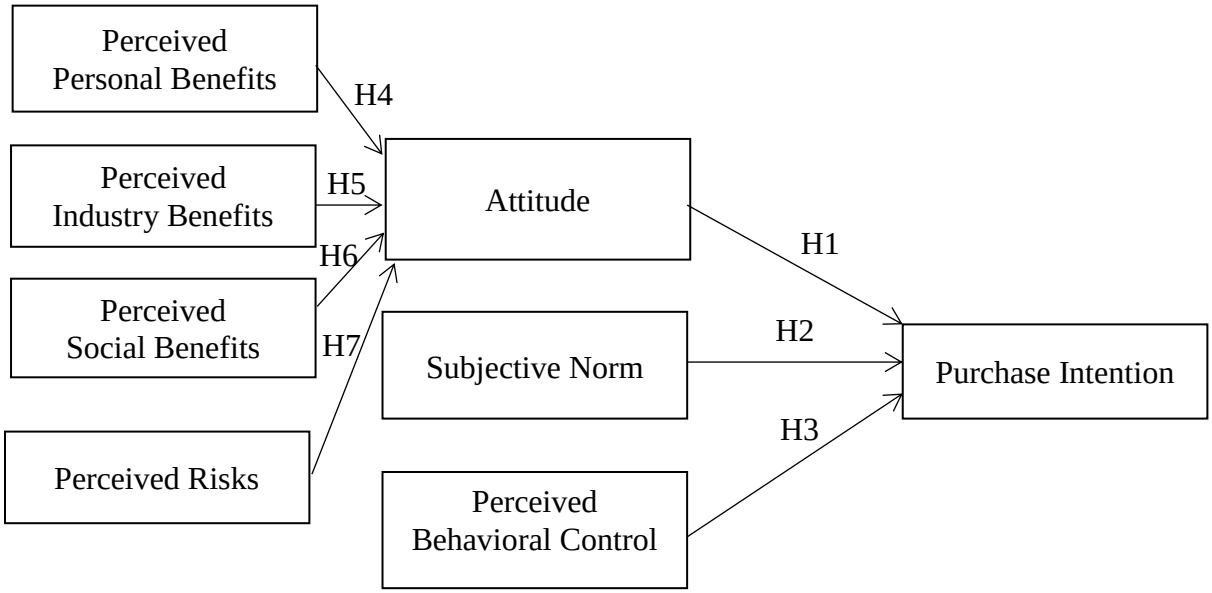
3.2.4 Perceived risks

Public concerns about GM technology and GM foods have been associated with several types of risks and uncertainties within three major areas: health, ecology, and ethics. Health risks of eating GM foods deal with the possibility of short- and long-term negative impacts of GMO consumption toward the human body, such as potential toxicity, allergens, and other possible consequences related to genetic modification (Zhang et al., 2016). In addition to the health issues, another potential concern with respect to GM foods is due to the herbicides and insect resistances of GM-based plants and consequent long-term impacts on the environment and other species (Zhang et al., 2016). Finally, some people believe it is better for humans respect 'Mother Nature' instead of changing the rules. Other ethical debates about GM foods are associated with social justice issues (Knight, 2009). In Canada, for example, unknown health and environmental impacts are the two most significant perceived risks of GM foods by consumers (Gregg et al., 2016). Consumers have negative impressions of GM foods because they believe more scientific evidence should be collected to identify and explain the possible consequences of eating GM foods, especially in the long term (Gregg et al., 2016). The same rationale can also be found in studies conducted in other countries (Hess et al., 2016). Although previous studies on risk assessments of GM plants have not provided substantial evidence of adverse effects of GM food consumption, insufficient data make drawing conclusions difficult (Domingo & Bordonaba, 2011). This situation might further increase concerns with respect to eating GM foods and sway people's opinion to the negative side. Based on the above discussion, we propose that:

H7: Perceived risks of GM food consumption will have a negative influence on attitudes.

The above hypotheses 4-7 are shown in Figure 3.2.

Figure 3.2 Revised TPB model in the context of the GM food purchase decision-making process



3.3 Culture and its potential moderating influences on consumers' planned behavior

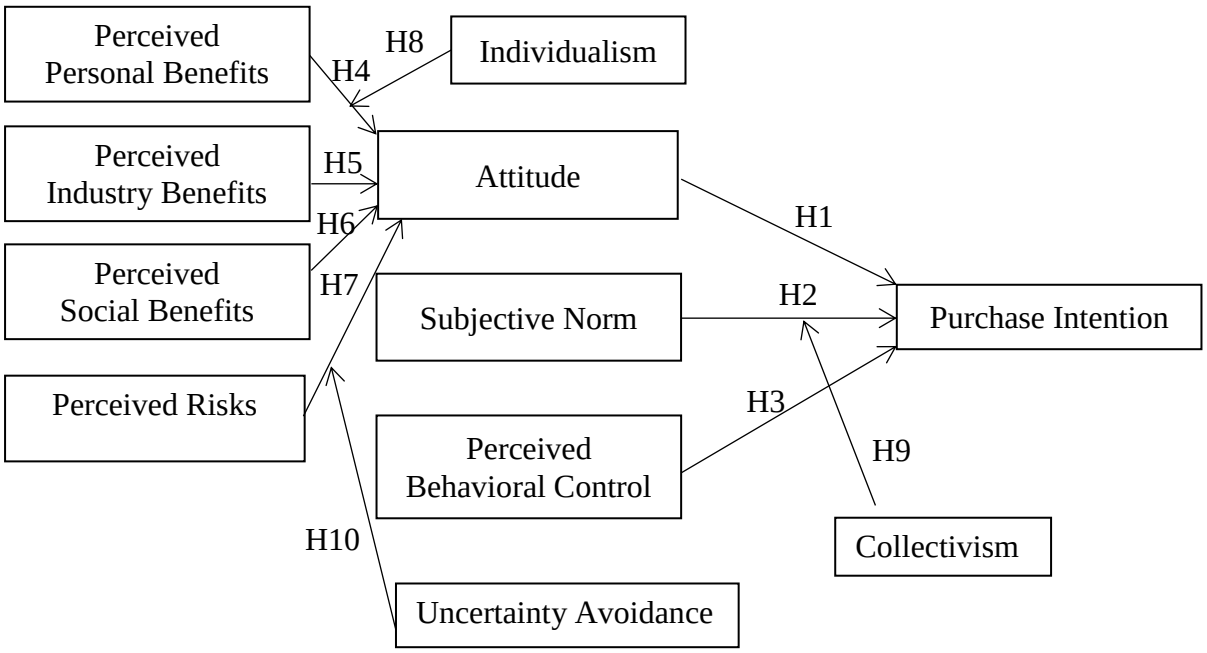
Consumer behaviors are influenced by the shared values and beliefs of culture (Singh 2006). Culture has been defined as "a set of values, ideas, artifacts and other meaningful symbols that help individuals communicate, interpret, and evaluate as members of society" (Engel et al. 1993, p. 3). Other researchers have defined culture as the knowledge of a value system that can be communicated and passed on to the next generation (Nagra, 2012). These different values frame what goals are appropriate to achieve in certain specific contexts. They affect the drives that motivate people to take further action as individuals, families, and social groups (Singh, 2006). Therefore, culture not only affects individual decision-making with respect to specific products but also shapes the structure of consumption within a community. A review of previous cross-cultural studies in marketing and communication management suggests that people with common political, ethical, or geographic characteristics share the same preferences and judging standards, which are, in turn, reflected in their consumption behaviors (Soares et al., 2007). Accordingly, consumer behaviors and communications across cultures are different from each other due to different value systems (De Mooij, 2004, 2015). In the context of food choice, Pieniak et al. (2009) investigated the association between traditional food consumption and motives for food choice among six

European countries (Belgium, France, Italy, Norway, Poland and Spain). Their results indicate that consumers from different countries shared the same factors (such as price, sensory appeal, and health benefits) when making food choices but evaluated those factors in a different order. Specifically, weight control had a significant negative connection with general attitude toward traditional foods in Norway and Poland while consumers from Spain are significantly sensitive to price (negative relationship with general attitude). Baker (2004) focused on studying the values driving organic food choices in Germany and the UK and found that consumers from the two countries shared the same ideas concerning values such as health, well-being, and quality of life. However, the product attributes they sought to achieve those values are very different. All of this evidence suggests that culture might have different moderating effects on consumers' decision-making.

Regarding the differences between national cultures, Hofstede (1983) and Hofstede and Hofstede (2005) identified six stable dimensions: individualism/collectivism, uncertainty avoidance, power distance, long-term orientation, masculinity, and indulgence. These dimensions have been applied in many cross-cultural marketing studies (Soares et al., 2007). For this study, we only applied individualism/collectivism and uncertainty avoidance in the model to predict consumer acceptance of GM foods at the individual level.

The following sections elaborate on the dimensions of individualism/collectivism and uncertainty avoidance, and how these two dimensions might potentially moderate relationships within the TPB model (see Figure 3.3).

Figure 3.3 Revised TPB model with cultural influences



3.3.1 Individualism and collectivism

Hofstede (n.d.) describes the index of individualism as "the degree of interdependence a society maintains among its members" (para. 4). It indicates the relationship between an individual and his or her fellow individuals and the degree to which people in a specific society prefer to act as individuals or as members of groups (Singh, 2006). As Hofstede and Hofstede (2005) suggest, individualism is associated with the way a person defines him- or herself in terms of "I" or "We"; Canada gets a score of 80 while China only scores 20 with respect to this dimension. This gap in individualism is the largest difference (60) between these two countries among the six dimensions. Accordingly, Canada can be characterized as an individualist society where most people are expected to take care of themselves and their direct families. When it comes to consumer behavior, people from Canada possibly have relatively more freedom and space for decision-making, and consumers make their choice based more on their personal values and goals rather than comments and suggestions from others (except for their direct families). Therefore, it is proposed that perceived personal benefits might have a stronger influence on Canadian consumer's attitude and purchase intention with respect to GM foods. China, on the other hand, has a highly collective

culture in which individuals are not only expected to look after themselves as well as their families but also supposed to consider other people in the group. Therefore, it is understandable that Chinese people might take more consideration of the benefits and goals of others in their groups when making their decisions. Chinese consumers are more likely to be influenced by norms of the group or opinions of others from the group compared to Canadian consumers. For example, a cross-cultural study on "Green Purchasing Behavior" (buying environmentally friendly products) between American and Chinese consumers suggests that subjective norm has a stronger influence on Chinese vs. American consumers' behavior intention (Chan & Lau, 2002). Korean consumers, with a similar collectivistic culture as China, also put more weight on the needs of families and groups compared to American consumers (Lee & Ro Um, 1992).

Individualism vs. collectivism is a cultural dimension that deals with whether a person only cares for him or herself and their direct family or social groups (Hofstede et al., 2010; Hofstede, n.d.). As GM food is now becoming a social and ethical issue around the world, consumers' decisions with respect to GM food production and application are not only personal (based on the perception of individual benefits and opinion) but also occur at the group level (related to the welfare of others in the same social group). With respect to decision-making related to GM food consumption, collectivist people who consider more about others in the social group might also consider others' opinions more seriously compared to individualist people who think more independently.

Based on the above discussion, it is reasonable to propose that the perception of personal benefits from GM food consumption plays a much more important role in the decision-making process for consumers who have individualistic cultural values. For consumers from a collectivist culture, other people's opinions and feelings rather than personal benefits might become their first consideration during purchase decision-making of GM foods. Accordingly, we hypothesize that:

H8: For Individualistic consumers, compared to collectivistic consumers, the relationship between perceived personal benefits and attitudes will be stronger.

H9: For Collectivistic consumers, compared to individualistic consumers, the relationship between perceived social norm and purchase intention is stronger.

3.3.2 Uncertainty avoidance

Uncertainty avoidance deals with the ambiguity that society perceives as threats and trying to avoid any unknown situations (Hofstede, n.d.). Cultures with lower uncertainty avoidance are believed to take risks more easily because they understand and accept that life is full of unknowns and risks. Therefore, they usually have a higher willingness to accept new things (Hofstede, n.d.). Conversely, people from a culture with higher uncertainty avoidance try to reduce the pressure of unknowns and potential risks in their daily life. They also feel relatively more anxious when perceiving any real or potential risks from decisions they make. Cultures with lower uncertainty avoidance are more likely to adopt innovations than cultures with stronger uncertainty avoidance (Singh, 2006). Indeed, consumers have different concerns over the application of biotechnology to produce GM foods due to the long-term unknown effects of the technology (Zhang et al., 2016). However, the social value of always staying safe will make consumers more sensitive to potential risks rather than benefits when making decisions. Therefore, perceived risks will play a more important role in forming consumers' attitudes toward GM foods in cultures with higher uncertainty avoidance. Both Finucane and Holup (2005) and Townsend (2006) suggest that perceptions of the objective unknown risks of eating GM foods depend on people's cultural beliefs and expectations. Finucane and Holup (2005) further argue that unknown risks and dread risks are two essential factors associated with public perceptions of risk from GM foods. According to the recent national consumer survey in Canada (Gregg et al., 2016), some participants who felt uncomfortable about GM foods said that current scientific evidence could not answer their questions about the specific health and environmental impacts. This indicates that some consumers are more sensitive to the unknown factors of risk than the dread factors. Therefore, we believe that the relationship between perception of these unknown risks and attitudes towards GM foods is potentially influenced by individual tolerance to uncertainties.

Another way to explore the influence of uncertainty avoidance among consumer behaviors with respect to GM foods is willingness to pay a premium (or to receive a discount) to avoid (or to accept) GM foods with a certain level of unknown risks. For example, Noussair et al. (2004) found that 35% of their participants were unwilling to buy any GM-related foods and about 65% were willing to buy GM foods under different conditions, especially when the price was significantly lower than regular foods (non-GMO). This indicates that some consumers might have zero

tolerance for the unknown loss, but others might pursue different goals from GM food consumption such as a cost-effective lifestyle. Hence, we hypothesize that:

H10: Among the consumers with higher scores on uncertainty avoidance, the relationship between perceived risks and attitudes is stronger.

4. PILOT STUDY

The primary purpose of the pilot study was to assess the dimensionality and reliability of the constructs used in the final survey questionnaire. The results of this pilot study informed our revisions and improvements to the final questionnaire used in the online consumer survey.

4.1 Procedure

The pilot study was conducted with university undergraduate students from Western Canada. Data were collected in the form of paper and pencil questionnaires. Ethics approval was obtained (see Appendix 1). A hard copy of the questionnaire and the consent form were packaged together in an envelope for each participant (see Appendix 2 for the Pilot Study consent form and Appendix 3 for the Pilot Study Questionnaire). Informed consent was obtained by reading and confirming the information in the consent form. Participants were expected to put the questionnaire into the envelope and return the envelope to the researcher after finishing the survey. After the survey, participants were encouraged to leave their e-mail addresses for follow-up if they were interested in the results of the study. All questionnaires were collected by the researcher for later coding and data input using Excel and SPSS 24.

4.2 Participants

A total of 141 undergraduate students participated in the pilot study and returned questionnaires. After the coding and checking processes, data from three respondents were eliminated due to incomplete questionnaires. The final valid sample size of the pilot study was therefore 138.

4.3 Measures

As the theoretical model used in the present study was developed from the classic TPB model (Ajzen, 1991) and the theory of cultural dimensions (Hofstede, 1984), most variables in our

model have been widely investigated in prior studies. Accordingly, this research has primarily adopted previously published measurement scales. Some modifications were necessary to suit the current context of consumer acceptance of GM foods. Participants were asked to indicate their agreement or disagreement with the statements provided using a 7-point Likert scale from 1 "Strongly disagree" to 7 "Strongly agree". Five demographic variables (gender, age, education, household income, and ethnicity) were also included in the survey as control variables (see Table 4.1).

The constructs of collectivism and uncertainty avoidance are important variables in our proposed model. According to Soares et al. (2007), six items developed from Furrer et al.'s (2000) cultural value scale are used to measure the level of collectivism. Respondents were asked to indicate their degree of agreement or disagreement with these statements. Two examples of these six statements are *"Individuals should sacrifice self- interest for the group"* and *"Group success is more important than individual success"*. Accordingly, high respondent scores on these items indicate a high level of collectivism, while low scores indicate a high level of individualism (Soares, 2005). Following the same method used by Soares (2005), we applied the reverse code of the individuals' scores of collectivism as the scores of individualism. To ensure consistency of measurements, a separate group of five statements from the same cultural value scales created by Soares (2005) was used to test uncertainty avoidance. Two examples of the five statements are *"It is important to have instructions spelled out in detail so that I always know what I am expected to do"* and *"Rules and regulations are important because they inform me of what is expected of me"*. According to Hofstede et al. (2010) and Hofstede (n.d.), uncertainty avoidance refers to "the extent to which people feel threatened by uncertainty and ambiguity and try to avoid them" (p. 188). Uncertainty averse individuals usually show more preference to follow rules and instructions in doing their daily work. Therefore, higher levels of agreement with these statements usually indicate a higher level of uncertainty avoidance. The same types of items were also applied by Jung and Kellaris (2004) to measure uncertainty avoidance in their cross-nation study. The reliability of these cultural value scales was tested in previous work and they are therefore used in the current study to measure the degrees of individualism and uncertainty avoidance (Soares, 2005).

Purchase intention of GM foods is the dependent variable in the proposed model, and its measurement is based on the item used by Chen (2008), which is adapted from Bredahl (2001). To ensure consistency of the construct measurement scales of the questionnaire, indicators for

measuring attitude, subjective norms, and perceived behavioral control in the pilot study were all adopted from previous work by Spence and Townsend (2006). In terms of the attitude indicator, participants were expected to show their general attitude towards applying GM technology in food industry using four different 7-point scales: from *very good* to *very bad*; *very right* to *very wrong*; *very safe* to *very dangerous*; and *very wise* to *very foolish*. For perceived subjective norm, three items were applied based on the established scales from both Spence and Townsend (2006) and Cook et al. (2002). In addition, the three indicators to measure perceived behavioral control were also adopted from previous work by Spence and Townsend (2006). One example indicator is *"My purchase or avoidance behavior is influenced by my families and friends"*, with a 7-point scale of agreement used to respond to the question. Based on the above discussions in the section 3.2, the indicators for measuring perceived benefits and risks were adapted from Bredahl (2001) and Chen (2008).

It should be noted that in the classic TPB model, the Attitude variable refers to the Attitude toward the Behavior, in our context, the attitude toward the behavior of purchasing GM food. However, several prior studies in the GM food context done in the EU countries (e.g. Spence and Townsend, 2006; Prati et al., 2012) have adopted the TPB model, and applied the attitudes toward using GM technology for food production as the proxy of consumers' attitudes toward the behavior of purchasing GM foods. Spence and Townsend (2006) argues that because real GM products are generally not available on the market in EU, the attitude toward the GM technology is a reasonable alternative. Chen (2008) also found that attitudes toward GM technology was a strong predictor to the attitudes toward GM product.

Previous studies have also found significant relationships between consumer's attitudes and decisions on GM foods consumption and several demographic variables. Gender is a demographic variable that is addressed in different research. For example, Moerbeek and Casimir (2005) found that women in EU countries were less accepting of GM foods than men, potentially due to their long-term perspectives on GM technology. In addition to gender, age is another variable applied to predict consumer purchase decision-making with respect to GM foods. Chen and Chern (2002) suggest that US participants aged 35-60 are willing to pay a higher premium than other age groups to avoid eating GM foods. Similar results are reported by Onyango (2004), with older people less likely to consume GM foods due to risk aversion. Chen and Chern (2002) also indicate that consumers from the middle-age group are willing to pay more for non-GM foods because of their

higher and more stable net income compared to younger and older generations. This suggests a negative relationship between consumers' income level and their acceptance of GM foods. Moreover, Onyango (2004) reports that people with only a high-school education are more likely to buy GM foods than those with a higher level of education or more formal training.

Table 4.1 Measures used in the pilot study

Construct	Indicators	Scales	References
Collectivism	Individuals should sacrifice self-interests for the group. Individuals should stick with the group even through difficulties. Group welfare is more important than individual rewards. Group success is more important than individual success. Individuals should only pursue their goals after considering the welfare of the group. Group loyalty should be encouraged even if individual goals suffer.	7-point scales from Strongly disagree to Strongly agree & Don't know	Adapted from Soares (2005)
Uncertainty Avoidance	It is important to have instructions spelled out in detail so that I always know what I'm expected to do. It is important to closely follow instructions and procedures. Rules and regulations are important because they inform me of what is expected of me. Instructions for operations are important. Standardised work procedures are helpful.	7-point scales from Strongly disagree to Strongly agree & Don't know	Adapted from Soares (2005)
Purchase Intention	If GM foods were available in food stores near me, I would…	7-point scales from Definitely avoid to Definitely buy & Don't know	Adapted from Bredahl (2001) and Chen (2008)
Attitude	In general, I believe that the use of GM technology in food production is…	7-point scales: Very good to Very bad; Very right to Very wrong Very dangerous to Very safe; Very foolish to Very smart	Adapted from Spence and Townsend (2006)
Subjective Norm	There is a clear public consensus on whether people should buy GM foods. My families and friends would think of me negatively if I buy GM foods My purchase or avoidance behavior is influenced by my families and friends.	7-point scales from Strongly disagree to Strongly agree & Don't know	Adapted from Spence and Townsend (2006); Cook et al. (2002)

Perceived Behavioral Control	How much control do you think you have over whether you can purchase or avoid GM foods?	7-point scales from No Control to Complete Control	Adapted from Spence and Townsend (2006)
	How confident are you that it is possible to choose or avoid GM foods?	7-point scales from Not confident to Complete Confident	
Perceived Personal Benefits	GM foods can potentially provide enhanced nutrition.		
	GM foods can result in better price because of the higher production.		
	GM foods may use fewer chemicals.		
Perceived Industry Benefits	In general, applying GM technology in food production will provide benefits to agriculture and food industries	5-point scales from Strongly disagree to Strongly agree & Don't know	Adapted from Bredahl (2001) and Chen (2008)
Perceived Social Benefits	Overall, applying GM technology to produce foods with higher productivity will provide benefits on maintaining the global food supply.		Adapted from Bredahl (2001) and Chen (2008)
	Overall, applying GM technology to produce foods with less use of chemicals will provide benefits to the environment.		
Perceived Risks	GM foods involve considerable health risks.		
	GM foods posit considerable risks to the environment.		
	GM foods raise considerable ethical risks or concerns		

4.4 Results

4.4.1 Descriptive information

The participants included 75 males (54.3%) and 63 females (45.7%). The majority of the sample (98.5%) were between 18 and 25 years of age. This was expected due to the nature of our sample, which also limited the generalizability of the pilot study. The final consumer survey would involve consumers from diverse age groups.

For highest education level, 52.2% of participants chose “University,” and 43.5 percent chose “Secondary school”. Only a few participants (4.3%) selected “Technical or College”. Because the participants were currently all university students, the above results indicate potential confusion with respect to the meaning of this question. To avoid the same problem, the question regarding education level was revised in the later questionnaire.

Regarding monthly household net income, 25.6% of the sample reported “less than $1000” while 22.6% of the sample chose “more than $10,000”. The remainder of the participants distributed themselves evenly across the different segments from $2,000 to $10,000. Detailed demographic information about the sample is provided in Table 4.2.

Table 4.2 Demographic characteristics of the sample in the pilot study

	N*	%
Gender		
Male	75	54.3
Female	63	45.7
Age		
18-25	135	98.5
26-35	2	1.5
Highest Education		
Secondary school	60	43.5
Technical/ College	6	4.3
University	72	52.2
Monthly household net income		
Less than $ 1000	34	25.6
From $1000 to $10000	69	51.8
More than $10000	30	22.6

* N=138

4.4.2 Assessment of measuring scales

We applied factor analysis in SPSS 24 to assess the dimensionality of the measurement scales. Specifically, Kaiser's K1 rule (1960, as cited in Courtney, 2013) was used as a criterion to test if the measuring items of each construct variable were unidimensional with only one factor's eigenvalue greater than one. The results from the SPSS suggest that every construct met the unidimensional criterion. Therefore, all items of the constructs were considered as unidimensional. To ensure the validity of indicators for each construct, the standardized loading of an indicator should be greater than 0.6 (Bagozzi & Yi, 1988). The results reported in Table 4.3 show that most indicators met the loading requirement.

According to Santos (1999), Cronbach's alpha is often used as a tool to indicate the reliability of variables in the multi-indicator questionnaires. Nunnally (1978, as cited in Panayides, 2013) suggests 0.7 is an acceptable level for the reliability coefficient. As shown in Table 4.3, every contrast has a Cronbach's alpha greater than 0.7 except for perceived subjective norm, which has a value of 0.297. This indicates that the measurement of this particular construct is not reliable. Therefore, alternative measurement scales should be considered in the later study.

To further assess the reliability of constructs in the proposed model, we tested discriminant validity by using the overlapping confidence intervals approach. This method was initially introduced by Anderson and Gerbing (1988). It requires that the 95% confidence intervals around the correlation value of two constructs should not include the value of 1.0.

As Table 4.4 shows, the 95% confidence intervals around the interrelations between constructs (except for between perceived social benefits and perceived industry benefits) do not overlap 1.0. This suggests the discriminant validity is acceptable. One of the possible explanations for the high correlation between consumers' perceived social benefits and perceived industry benefits is that participants might perceive social and industry benefits together as "benefits to others (e.g., people they may not know and care about)". Therefore, while it is relatively easier for participants to understand differences between "benefits to me" (personal benefits) and "benefits to others" (social and industry benefits), it might be more difficult to distinguish industry benefits from social benefits. Note again that the participants in the pilot study were all university students, so this result might only indicate their opinions as a specific group in the general population and should not be assumed to represent general consumers.

Table 4.3 Construct dimensionality and reliability (pilot study)

Construct	Indicator	Standardized loadings	Cronbach's α
1. Collectivism	1	0.503	0.728
	2	0.568	
	3	0.713	
	4	0.757	
	5	0.68	
	6	0.661	
2. Uncertainty Avoidance	1	0.776	0.882
	2	0.822	
	3	0.854	
	4	0.799	
	5	0.867	
3. Attitude	1	0.952	0.944
	2	0.954	
	3	0.897	
	4	0.900	
4. Subjective Norm	1	0.735	0.297
	2	0.737	
	3	0.423	
5 Perceived Behavioral Control	1		0.837
	2		
6. Perceived Personal Benefits	1	0.900	0.737
	2	0.892	
	3	0.625	
7. Perceived Social Benefits	1		0.758
	2		
8. Perceived Risks	1	0.937	0.926
	2	0.928	
	3	0.934	

Table 4.4 Discriminant validity (pilot study)

	1. Collect.	2. UA	3. AT	4. SN	5. PBC	6. PPB	7. PIB	8. PSB	9. PR	10. PIGM1	11. PIGM2
1.Collectivism											
2.Uncertainty Avoidance	0.323** (0.145; 0.433)										
3.Attitude	0.078 (-.064; 0.170)	-0.074 (-0.188; 0.074)									
4. Subjective Norm	0.033 (-0.108; 0.158)	-0.013 (-0.163; 0.140)	-0.215* (-0.446; -0.047)								
5.Perceived Behavioral Control	-0.081 (0.148; 0.055)	-0.117 (-0.190; 0.038)	-0.001 (-0.152; 0.151)	0.100 (-0.059; 0.203)							
6. Perceived Personal Benefits	0.031 (-0.111; 0.154)	-0.013 (-0.170; 0.149)	0.678** (0.627; 0.946)	-0.137 (-0.290; 0.045)	0.079 (-0.140; 0.342)						
7. Perceived Industry Benefits	0.134 (-0.029; 0.165)	-0.059 (-0.152; 0.081)	0.710** (0.476; 0.701)	-0.049 (-0.155; 0.092)	0.008 (-0.165; 0.179)	0.719** (0.420; 0.612)					
8. Perceived Social Benefits	0.210 (-0.042; 0.191)	0.013 (-0.134; 0.155)	0.701** (0.568; 0.838)	-0.016 (-0.166; 0.140)	0.052 (-0.154; 0.269)	0.686** (0.480; 0.723)	0.816** (0.837; 1.102)				
9. Perceived Risks	-0.040 (-0.122; 0.079)	0.152 (-0.021; 0.209)	-0.742** (-0.708; -0.503)	0.240* (0.035; 0.271)	<0.001 (-0.172; 0.173)	-0.468** (-0.460; -0.216)	-0.527** (-0.706; -0.365)	-0.494** (-0.542; -0.266)			
10. Purchase Intention GM1	0.194* (0.009; 0.185)	0.049 (-0.047; 0.130)	0.683** (0.414; 0.610)	-0.100 (-0.175; 0.051)	-0.076 (-0.226; 0.094)	0.592** (0.289; 0.492)	0.593** (0.392; 0.676)	0.546** (0.281; 0.519)	-0.561** (-0.670; -0.377)		
11. Purchase Intention GM2	-0.049 (-0.082; 0.045)	0.006 (-0.125; 0.135)	0.444** (0.273; 0.587)	-0.112 (-0.251; 0.061)	-0.109 (-0.323; 0.082)	0.468** (0.269; 0.571)	0.472** (0.366; 0.790)	0.489** (0.316; 0.648)	-0.338** (-0.621; -0.192)	0.525** (0.472; 0.881)	

*** = p<0.05; **= p<0.01; Both upper and lower bounds of the estimated factor correlations with 95% confidence interval are provided.**

4.5 Discussion

Based on the knowledge acquired from the pilot study, we conducted an additional literature review and consulted with other experienced researchers. We made several modifications to the questionnaire for the final study.

First, after coding and data clearance, we noticed that some participants had very little knowledge on the topic of GM foods or GM technology, which could be an obstacle for them to understand some of the questions and the topic in general. Therefore, we provided a brief definition of GM foods before asking related questions.

In addition, we changed the order of some questions to avoid the potential ordering effect. Some questions were also simplified in terms of wording to remove potential double-barreled questions. Based on a suggestion from our research collaborator, all original 7-point scales used in the pilot study were replaced by 5-point scales in the online consumer survey.

We changed the measurement scale for the construct of perceived social norm (SN) because of the poor reliability exhibited in our data. Alternative scales from the literature were evaluated. We adapted Ruiz-Mafe et al.'s (2016) scale for the final study. This new scale includes three items.

We adjusted some wording in the questions about purchase intention (PI) to make them clearer. We also changed the wording with respect to perceived behavioural control (PBC) to make it more realistic.

The results suggest the participants had some confusion with respect to their answers to the "Highest Education" question. We know for certain that all participants were second-year university students. However, some responded with "Secondary school" and others with "University". In the revised questionnaire, we reworded the question and asked participants to indicate the "Highest Education Completed".

Our research collaborator suggested that Canadians were more likely to consider their household incomes in the context of "annual income" rather than "monthly income". We thus adjusted our final questionnaire accordingly. Following from the above discussion and questionnaire revisions based on the pilot study, the next section provides details and results of the formal online survey.

5. CANADIAN CONSUMER SURVEY

5.1 Methodology

As the major step of this research, the online questionnaire-based survey was conducted by cooperating with a third-party social research institution from Western Canada.

5.1.1 Survey method

An online questionnaire-based survey was selected for this qualitative study due to several considerations, including both the advantages and disadvantages of survey methodology. First, one of the primary objectives of the study was to test our proposed conceptual model in the context of consumer acceptance of GM foods. In this study, we were more interested in understanding consumers' attitudes and purchase intentions of GM foods within the general Canadian population than opinions from specific individuals. Therefore, we needed a suitable method to collect quantitative data from a relatively large number of respondents under time and budget limitations. A questionnaire-based survey is one of the most cost-effective ways to collect data from a relatively large sample under time pressure (Schmidt & Hollensen, 2006). Second, groups of pre-designed questions from previous studies can be adapted and applied in our questionnaire to measure different variables in the current conceptual model (Frewer et al., 2013). This further increases the relatability of sample data. Finally, by using an online survey panel our survey could be completed on different devices by respondents across Canada, which reduces possible geographical bias of the sample.

On the other hand, applying a questionnaire-based survey also introduces potential limitations to our study. For example, respondents to the online survey might be limited to people who have access to the Internet. In addition, the response rate of the questionnaire-based survey may be low, and individuals who are willing to be respondents of the survey might have personal interests and thoughts about GM foods or GM technology. As a result, these respondents might not accurately represent all Canadian consumers. These two situations would introduce biases to the sample and influence the results of the study. However, considering the merits of the method and our time and budget constraints, these limitations were deemed acceptable.

Based on the above discussion, we selected a questionnaire based online survey as the method for the study.

5.1.2 Power and sample size

Previous studies of consumer acceptance of GM foods or other new foods used a general sample size of about 300-800 (Cook et al., 2002; Chen, 2008; Lusk et al., 2015). Considering our budget and time limitations, the proposed sample size for this phase of our work is about 500.

The power of statistical tests is the probability of rejecting a null hypothesis when it is false. Although there is no consensus on a perfect level of statistical power, some researchers and textbooks suggest 0.8 is acceptable for typical situations in practice (Cohen, 1992). This value achieves a good balance between a high level of power and not wasting unnecessary resources (Diez et al., 2015).

To estimate the desired sample size, we used the A-priori Sample Size Calculator for Multiple Regression (Soper, 2017). This sample size calculator is based on the scientific literature (e.g., Abramowitz & Stegun, 1965; Cohen, 1988; Cohen et al., 2003) and requires several essential parameters, including anticipated effect size (F^2), desired statistical power level, number of predictors, and probability level. Our anticipated effect size is medium (correlation coefficient r=0.3). For an r equal to 0.3, the effect size (F^2) can be computed using the following equation: $F^2 = r^2 / (1-r^2) = 0.09/0.91 = 0.1$. Therefore, the anticipated effect size was set at 0.1. As mentioned above, the desired statistical power for this study is 0.8. Moreover, the number of predictors in the current study varies from 3 to 11, depending on the model. On the high end of the more complex models, which include interaction terms and control variables, the larger k determines the minimum required sample size. Finally, the probability level alpha was set at 0.05, which is a commonly accepted alpha for regression analyses (Cohen, 1992).

Based on these parameters, Soper's (2017) calculator provided an estimated minimum sample size for our multiple regression of 226. Budgeting for potential un-usable responses, we rounded this up to 250. Further, because our research involves a comparison study between cultures we set our minimum sample size at 500.

5.1.3 Procedure

To further ensure the reliability of the online survey, a soft launch of the online survey using the revised questionnaire was conducted with 30 participants before opening it more broadly. Feedback from this soft launch indicated that some participants were confused about the questions used to measure two of Hofstede's cultural dimensions. Therefore, two short paragraphs of introduction about individualism/collectivism and uncertainty avoidance were added before the specific questions on cultural values. Also, the 7-point Likert scales were replaced by 5-point scales for the convenience of participants. Moreover, statements under each question were coded previously and shown randomly to each participant. Finally, as per the MCM survey (2016), we added the following screening question at the beginning of the questionnaire: "Who is the primary grocery shopper (the person responsible for at least 50% of food purchases) in your household?". The three possible answers for this question were "I am; Shared responsibilities; Someone else". As the opinions of daily grocery shoppers are believed to be more reliable in terms of providing meaningful data to our study, data from participants who chose "Someone else" in response to this question were not included in the final dataset. Based on the data collected from the pilot study, the survey was expected to take an average of about 15 minutes to complete. Moreover, participants were expected to self-identify their ethnicities at the beginning of the survey. Implied consent was granted by reading the consent form (see Appendix 5 for the Consent Form). Similar to the pilot study, participants were given the opportunity to choose the option of "don't know" for most of the questions if they did not have a specific opinion or did not want to answer. Also, participants were required to give a response to each question in the questionnaire with the exception of comments (see Appendix 6 for the Survey Questionnaire). Participants received different end massages depending on their status of the survey accomplishment (see Appendix 7).

5.1.4 Participants and samples

The formal online consumer survey was open for 14 days. Overall, 8377 invitation letters were sent out through E-mail (See Appendix 4). 679 accepted the innovation and participated in the survey yielding a response rate of 8.1%. Among these 679 participants, 78 only partially completed the survey, 51 were removed by the screening question, and 35 were invalid since the quotas were met already. The final valid finished and valid data of the formal online survey was 515.

5.1.5 Measures

As mentioned in Section 4.5, the indicators and measurement scales of the online survey questionnaire were based on previous studies as well as lessons learned from the pilot study. Several revisions and modifications were made to improve the quality of the online questionnaire. Three items adapted from Ruiz-Mafe et al. (2016) were used to measure subjective norms in the online questionnaire. In addition, to further understand consumers' willingness to pay (WTP) for GM1 and GM2 products, two indicators measuring WTP in the pilot study were also added to the online questionnaire. The detailed indicators and scales for each construct variable are provided in Table 5.1.

Table 5.1 Construct measurements in the final online consumer survey

Construct	Indicators	Scales	References
Collectivism	Individuals should sacrifice self-interests for the group.		Adapted from Soares (2005)
	Individuals should stick with the group even through difficulties.		
	Group welfare is more important than individual rewards.		
	Group success is more important than individual success.		
	Individuals should only pursue their goals after considering the welfare of the group.		
	Group loyalty should be encouraged even if individual goals suffer.	5-point scales from Strongly disagree to Strongly agree & Don't know (applied for both Collectivism and Uncertainty Avoidance)	Adapted from Soares (2005)
Uncertainty Avoidance	It is important to have instructions spelled out in detail so that I always know what I'm expected to do.		
	It is important to closely follow instructions and procedures.		
	Rules and regulations are important because they inform me of what is expected of me.		
	Instructions for operations are important.		
	Standardised work procedures are helpful.		
Purchase Intention	If GM foods were available in food stores near me, I would…	5-point scales from Definitely avoid them to Definitely seek them out & Don't know	Adapted from Bredahl (2001) and Chen (2008)
Attitude	In general, I believe that the use of GM technology in food production is…	5-point scales: Very good to Very bad; Very dangerous to Very safe; Very foolish to Very smart	Adapted from Spence and Townsend (2006)
Subjective Norm	I think that people important to me supported my choice of GM foods.	5-point scales from Strongly disagree to Strongly agree & Don't know	Adapted from Ruiz-Mafe et al. 2016
	I think people whose opinions I valued preferred that I choice GM foods for daily diets.		
	I think that people who influenced my behavior wanted me to buy GM foods instead of any alternative products.		

Perceived Behavioral Control	How much control do you think you have over whether you can purchase or avoid GM foods? How confident are you that it is possible to choose or avoid GM foods?		Adapted from Spence and Townsend (2006)
Perceived Personal Benefits	GM foods can potentially provide enhanced nutrition. GM foods can result in better price because of the higher production. GM foods may use fewer chemicals.		
Perceived Industry Benefits	In general, applying GM technology in food production will provide benefits to agriculture and food industries	5-point scales from Strongly disagree to Strongly agree & Don't know	Adapted from Bredahl (2001) and Chen (2008)
Perceived Social Benefits	Overall, applying GM technology to produce foods with higher productivity will provide benefits on maintaining the global food supply. Overall, applying GM technology to produce foods with less use of chemicals will provide benefits to the environment.		Adapted from Bredahl (2001) and Chen (2008)
Perceived Risks	GM foods involve considerable health risks. GM foods posit considerable risks to the environment. GM foods raise considerable ethical risks or concerns		
WTP1	If a loaf of bread made from regular non-GM wheat sells for $3.00 at your local food store, how much would you pay for similar bread made from GM wheat?	From "$ 4.00 or more" to "Would not buy"	
WTP2	If a loaf of bread made from regular non-GM wheat sells for $3.00 at your local food store, how much would you pay for similar bread made from GM wheat that contains enhanced nutrition?	From "$ 4.00 or more" to "Would not buy"	

5.1.6 Data analysis

Data analysis was primarily based on regression analyses. We tested the relationships between dependent variables (e.g., purchase intention) and independent variables (e.g., attitude, subjective norm, and perceived behavior control) within the above conceptual models. In particular, the moderating impacts of two cultural values—collectivism (and individualism) and uncertainty avoidance—in the final conceptual model were tested based on the method of Baron and Kenny (1986). In addition, to test the validity of the model we followed the same processes in the pilot study to check the dimensionality, reliability, and discriminant validity of the measurement scales in the Canadian consumer survey.

In the regression analyses, linear regression models were employed to detect the relationships. Specifically, the first three hypotheses were tested using the following model:

Purchase Intention =β1×Attitude + β2×Subjective Norm + β3×Perceived Behavioral Control + error …… (Model 1)

Next, hypotheses 4-7 were tested using the following model:

Attitude = β4×Perceived Personal Benefits + β5×Perceived Industry Benefits + β6× Perceived Social Benefits + β7×Perceived Risks + error …… (Model 2)

Hypotheses 8-10 involve the concept of moderation. According to Baron and Kenny (1986), moderation effects can be detected by adding interaction terms, assuming the moderators might also have a direct influence on the dependent variables. The moderating relationships are considered significant when the interaction terms have significant regression coefficients. To test the potential moderating effect of individualism on the relationship between perceived personal benefits and consumer attitude, the interaction term “Perceived Personal Benefits (PPB) × Individualism” was created and added to the model. Similarly, another interaction term “Perceived Risk × Uncertainty Avoidance” was created to test the proposed moderating effect of uncertainty avoidance on the relationship between perceived risks and consumer attitude. Accordingly, hypotheses 8 and 10 were tested by the following model:

Attitude = β4×Perceived Personal Benefits + β5×Perceived Industry Benefits + β6× Perceived Social Benefits + β7×Perceived Risks + β8×Perceived Personal Benefits× Individualism + β10×Perceived Risks × Uncertainty Avoidance + error …… (Model 3)

Finally, the moderating effect of the subjective norm was tested by a model developed from Model 1 with the addition of the interaction term "Subjective Norm × Collectivism". Therefore, hypothesis 9 was tested by the last model:

Purchase Intention =β1×Attitude + β2×Subjective Norm + β3×Perceived Behavioral Control + β9×Subjective Norm×Collectivism +error …… (Model 4)

In addition to Baron and Kenny (1986), Conditional Process Analysis (Hayes, 2012) is another commonly applied tool to conduct moderation analysis. Among several models offered by Hayes' PROCESS macros, Model 1 (one X, one Y, and one proposed moderation variable, M) is the most suitable choice for this study. However, we noted that "PROCESS does not allow more than one variable to be listed in X bar.... so if the desired model has k independent variables, the PROCESS model can be run k times" (Hayes, 2013, p. 437). Our proposed moderation model has multiple independent variables. Therefore, the Hayes' PROCESS macro is not suitable for some of our hypothesized relationships. The conceptual method proposed by Baron and Kenny (1986) allows more than one independent variable of interest (PPB and PR in model 3) to be considered. Because both PPB and PR are significant predictors of consumer attitude, we believe the independent variables and their moderating variables should be considered simultaneously. Therefore, Baron and Kenny (1986) is still our first choice for this portion of the analysis.

5.2 Results

5.2.1 Descriptive information

The valid data are derived from the responses of 253 men (49.1%), 253 women (49.1%), and 9 participants (1.8%) who chose "Other" or "Prefer not to say". In terms of age, a large group

of participants were between 26 and 35 (24.9%). In addition, the percentages of the sample in three age segments (46-55; 56-65; 66 or above) are very similar. For education level, 42.3% of participants had completed education in a college or technical institute while another 31.7% had obtained a bachelor's degree from a university. Finally, more than half (58.3%) of the total sample claim their annual household income before tax is between $25,000 and $125,000. Finally, 123 of the participants identified themselves with Asian ethnicity, and the rest of 392 from Non-Asian cultural backgrounds (see Table 5.2).

Table 5.2 Demographic characteristics of respondents (Canadian Consumer Survey)

	Number	%	Canadian Census* 2016 (%)
Gender			
Male	253	49.1	49.1
Female	253	49.1	50.9
Other/ Prefer not to say	9	1.8	
Age			
18-25	23	4.5	10.1
26-35	128	24.9	13.1
36-45	75	14.6	12.9
46-55	98	19.0	14.5
56-65	95	18.4	13.6
66 or above	88	17.1	15.7
Prefer not to say	8	1.6	
Highest level of education			
High school	45	8.7	23.6
College or technical institute	218	42.3	35.0
Bachelor's degree	163	31.7	20.4
Master's degree	68	13.2	9.8**
Ph.D. degree	16	3.1	
Prefer not to say	5	1.0	
Household income (before tax)			
Under $25,000	31	6	
$25,000-$59,999	104	20.2	
$60,000-$125,000	196	38.1	
More than $125,000	97	18.8	
Prefer not to say	87	16.9	
Ethnicity			
Asian	123	23.9	17.7
Non-Asian	392	76.1	

* As cited from Statistics Canada (n.d.).

** This number includes people with degrees above bachelor's level

5.2.2 Construct dimensionality and reliability

Factor analysis was applied to assess the dimensionality and reliability of the measurement scales. The results are reported in Table 5.3. The Cronbach's alpha for most constructs is greater than 0.70 (Nunnally, 1978 as cited in Panayides, 2013), which indicates the acceptable reliability of the indicators used to measure the construct in the model. In addition, the standardized loadings of most indicators are greater than 0.6 (Bagozzi & Yi, 1988). However, the results also suggest that the reliability of the three-item scale for measuring subjective norm (adapted from Ruiz-Mafe et al., 2016) is still not acceptable due to its low Cronbach's alpha (0.538). In terms of standardized factor loading, the first indicator has a loading value of 0.373, which is lower than the suggestion of 0.60 from Bagozzi and Yi (1988). The remaining two indicators have values greater than 0.8. After the first indicator of subjective norm measurement is deleted, the Cronbach's alpha improves from 0.537 to 0.742, which is greater than the above criterion. Only two indicators of the subjective norm are therefore considered in the later data analysis. The above discussion and modifications suggest the final measurement scales applied in the online consumer survey had an acceptable level of construct dimensionality and reliability. For the subsequent regression analyses, composite indices were created for each construct by calculating the mean values of multiple indicators of the same construct.

5.2.3 Discriminant validity

The results of discriminant validity analysis for the online survey are reported in Table 5.4. None of the 95% confidence intervals of the correlation coefficients between individual construct include the value of 1.0. Therefore, the applied measurement items in the model provide acceptable discriminant validity.

Table 5.3 Construct dimensionality and reliability (Canadian Consumer Survey)

Construct	Indicator	Standardized loadings	Cronbach's α
1. Collectivism	1	0.794	0.864
	2	0.694	
	3	0.809	
	4	0.824	
	5	0.737	
	6	0.767	
2. Uncertainty Avoidance	1	0.786	0.818
	2	0.794	
	3	0.766	
	4	0.691	
	5	0.795	
3. Attitude	1	0.958	0.939
	2	0.929	
	3	0.944	
4. Subjective Norm	1	0.373	0.538
	2	0.846	0.742 (if item 1 removed)
	3	0.886	
5 Perceived Behavioral Control (PBC)	1		0.811
	2		
6. Perceived Personal Benefits(PPB)	1	0.827	0.683
	2	0.805	
	3	0.713	
7. Perceived Social Benefits	1		0.692
	2		
8. Perceived Risks	1	0.851	0.758
	2	0.825	
	3	0.788	

Table 5.4 Discriminant validity (Canadian Consumer Survey)

	1. Collect.	2. UA	3. AT	4. SN	5. PBC	6. PPB	7. PIB	8. PSB	9. PR	10. PIGM1	11. PIGM2
1.Collectivism											
2.Uncertainty Avoidance	0.197**										
	(0.146; 0.368)										
3.Attitude	0.054	-0.035									
	(-0.025; 0.107)	(-0.071; 0.031)									
4.Subjective Norm	0.006	0.013	0.371**								
	(-0.072; 0.082)	(-0.051; 0.069)	(0.327; 0.520)								
5.Perceived Behavioral Control	-0.029	0.071	0.006	-0.048							
	(-0.097; 0.049)	(-0.011; 0.102)	(-0.090; 0.102)	(-0.138; 0.043)							
6. Perceived Personal Benefits	0.194**	0.052	0.663**	0.226**	-0.015						
	(0.093; 0.243)	(-0.025; 0.093)	(0.683; 0.835)	(0.136; 0.315)	(-0.107; 0.078)						
7. Perceived Industry Benefits	0.105*	0.061	0.664**	0.229**	0.016	0.621**					
	(0.009; 0.129)	(-0.015; 0.077)	(0.530; 0.651)	(0.103; 0.245)	(-0.060; 0.085)	(0.413; 0.521)					
8. Perceived Social Benefits	0.056	0.109*	0.716**	0.249**	-0.008	0.686**	0.687**				
	(-0.025; 0.113)	(0.013; 0.119)	(0.679; 0.807)	(0.143; 0.303)	(-0.091; 0.076)	(0.553; 0.669)	(0.724; 0.879)				
9. Perceived Risks	0.047	0.075	-0.747**	-0.311**	-0.045	-0.482**	-0.528**	-0.561**			
	(-0.032; 0.104)	(-0.007; 0.097)	(-0.824; -0.704)	(-0.356; -0.201)	(-0.124; 0.041)	(-0.502; -0.362)	(-0.702; -0.522)	(-0.629; -0.483)			
10. Purchase Intention GM1	0.057	-0.008	0.763**	0.397**	0.014	0.585**	0.598**	0.606**	-0.647**		
	(-0.025; 0.119)	(-0.061; 0.051)	(0.763; 0.885)	(0.297; 0.457)	(-0.074; 0.102)	(0.485; 0.622)	(0.648; 0.829)	(0.559; 0.707)	(-0.758; -0.615)		
11. Purchase Intention GM2	0.068	0.075	0.718**	0.307**	0.002	0.589**	0.561	0.665**	-0.607**	0.688**	
	(-0.014; 0.106)	(-0.007; 0.086)	(0.580; 0.690)	(0.168; 0.305)	(-0.070; 0.073)	(0.396; 0.508)	(0.485; 0.639)	(0.512; 0.627)	(-0.590; -0.466)	(0.504; 0.609)	

* = p<0.05; **= p<0.01; Both upper and lower bounds of the estimated factor correlations with 95% confidence intervals are provided.

5.2.4 Testing of hypothesized relationships

The hypothesized relationships in the model (see Figure 3.3) were tested using four linear regression models with SPSS 24, with the summary results reported in Table 5.5.

Table 5.5 Regression models and results

Model	DV	IV	Proposition tested	Standardized coefficient (β)	Adjusted R^2	p	Supported
1	PI	Attitude	H1 (+)	0.696	0.506	<0.001	Yes
		Subjective Norm	H2 (+)	0.043		0.233	Not
		Perceived Behavioral Control	H3 (+)	-0.005		0.891	Not
2	Attitude	Perceived Personal Benefits	H4 (+)	0.188	0.743	<0.001	Yes
		Perceived Industry Benefits	H5 (+)	0.161		<0.001	Yes
		Perceived Social Benefits	H6 (+)	0.217		<0.001	Yes
		Perceived Risks	H7 (-)	-0.462		<0.001	Yes
3	Attitude	Perceived Personal Benefits		0.203	0.745	<0.001	
		Perceived Industrial Benefits		0.159		<0.001	
		Perceived Social Benefits		0.231		<0.001	
		Perceived Risks		-0.359		<0.001	
		PPB×Indi*	H8	-0.028		0.360	Not
		PR×UA	H10	-0.112		0.037	Yes
4	PI	Attitude		0.692	0.509	<0.001	
		Subjective Norm		-0.048		0.431	
		Perceived Behavioral Control		-0.002		0.95	
		SN×Collect	H9	0.112		0.061	Supported at 0.1 level

***** Individualism is reverse coded from the score of collectivism

Predictors of consumer purchase intention of GM foods

We hypothesized that attitude, subjective norm, and perceived behavioural control were significant predictors of purchase intention. We tested this group of relationships using regression Model 1.

Purchase Intention =β1×Attitude + β2×Subjective Norm + β3×Perceived Behavioral Control + error …… (Model 1)

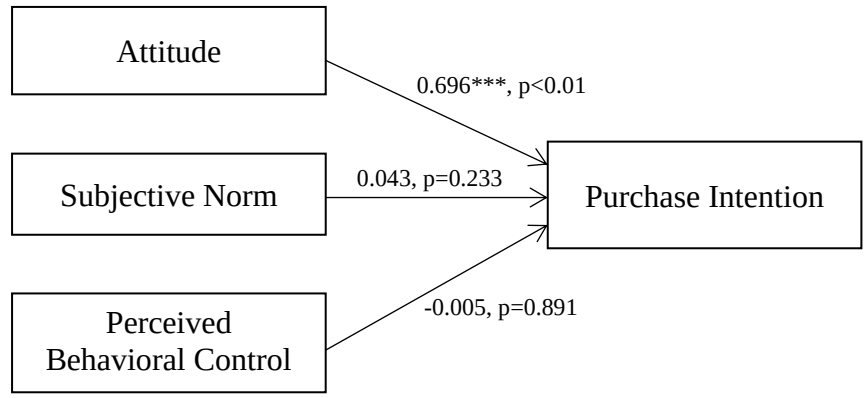
The results of this regression analysis are reported in Table 5.6 and Figure 5.1.

Table 5.6 Regression analysis of Model 1

Model	IV	Unstandardized Coefficient		Standardized Coefficient	t	p
		B	Std. Error	β		
1	Constant	0.763	0.167		4.572	<0.001
	Attitude	0.786	0.041	0.696	19.243	<0.001
	Subjective Norm	0.056	0.047	0.043	1.194	0.233
	Perceived Behavioral Control	-0.006	0.043	-0.005	-0.138	0.891

DV: Purchase Intention

Figure 5.1 Predictors of consumer purchase intention of GM foods



* p<0.1; ** p<0.05; *** p<0.01

The results suggest that H1 is supported (β=0.696, p<0.001) by the data but not H2 or H3. This indicates that consumers' attitudes toward GM food consumption is a significant factor explaining purchase intention of GM foods, while subjective norms (H2: β=0.043, p=0.233) and perceived behavioral control (H3: β=-0.005, p=0.891) are not. The results of the regression (Model 1) also suggest that about 50.6% of the variance in the dependent variable, purchase intention, is explained by the three predictors in the model.

Predictors of consumer attitudes toward GM foods

Regarding the predictors of consumer attitudes toward GM foods, we hypothesized that all three types of perceived benefits (personal benefits, industrial benefits, and social benefits) and the perceived risks are significant predictors of consumer attitude. More specifically, perceived personal benefits, perceived industrial benefits, and perceived social benefits are expected to positively influence consumer attitudes toward GM food consumption (H4-6). Perceived risks is proposed to be negatively connected with the formation of consumer attitude. To test this group of hypotheses, we used regression Model 2.

$$\text{Attitude} = \beta 4 \times \text{Perceived Personal Benefits} + \beta 5 \times \text{Perceived Industry Benefits} + \beta 6 \times \text{Perceived Social Benefits} + \beta 7 \times \text{Perceived Risks} + \text{error} \quad \text{(Model 2)}$$

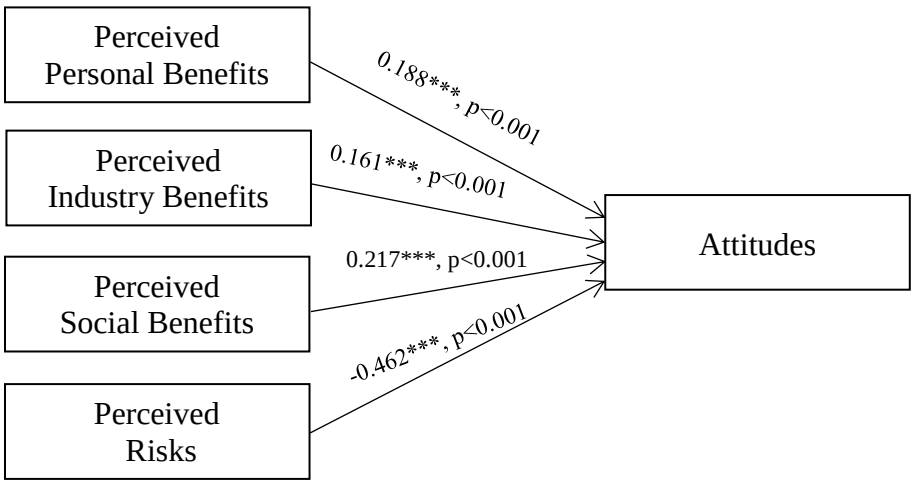
The results of this regression analysis are reported in Table 5.7 and Figure 5.2.

Table 5.7 Regression analysis of Model 2

Model	IV	Unstandardized Coefficient		Standardized Coefficient	t	p
		B	Std. Error	β		
2	Constant	2.408	0.201		11.969	<0.001
	Perceived Personal Benefits	0.221	0.041	0.188	5.465	<0.001
	Perceived Industry Benefits	0.142	0.031	0.161	4.626	<0.001
	Perceived Industry Benefits	0.225	0.039	0.217	5.690	<0.001
	Perceived Risks	-0.475	0.031	-0.462	-15.375	<0.001

DV: Attitude

Figure 5.2 Predictors of consumer attitude toward GM foods



* p<0.1; ** p<0.05; *** p<0.01

The above results show H4-7 are all supported by our data (H4: β=0.188, p<0.001; H5: β=0.161, p<0.001; H6: β=0.217, p<0.001; H7: β = -0.462, p<0.001). Moreover, 74.3% of the variance in the dependent variable, attitude, can be explained by these four factors in Model 2.

Comparison of cultural values between Asian and Non-Asian groups

As it has mentioned above, the total sample was made up of two groups (Asian and Non-Asian) depending on the ethnicity. Given the opinion that the influences of cultural values can be understood under different levels including national, sub-groups and individual level, we started our analysis from a comparison of the cultural values between Asian and Non-Asian groups. Basically, we were interested if the potential differences of two cultural values could be found in the sub-group level. Therefore, we did an independent sample t-test in SPSS. The result was reported in Table 5.8 and 5.9.

Table 5.8 Statistics of Asian and Non-Asian groups

Hidden variable set by panel		N	Mean*	Std. Deviation
Collectivism	General Pop	391	3.1047	0.76783
	Known Asian Ethnicity	121	3.2344	0.77110
Uncertainty Avoidance	General Pop	390	3.8673	0.57969
	Known Asian Ethnicity	122	3.9680	0.62530

* Mean value is group average score

Table 5.9 Independent sample t-test on cultural values between Asian and Non-Asian groups

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the	
									Lower	Upper
Collectivism	Equal variances assumed	0.355	0.552	-1.623	510	0.105	-0.12975	0.07996	-0.28683	0.02734
	Equal variances not assumed			-1.619	199.171	0.107	-0.12975	0.08014	-0.28777	0.02828
Uncertainty Avoidence	Equal variances assumed	0.230	0.632	-1.644	510	0.101	-0.10077	0.06129	-0.22118	0.01964
	Equal variances not assumed			-1.580	190.524	0.116	-0.10077	0.06377	-0.22655	0.02502

The result in the Table 5.8 suggests that participants from Asian and Non-Asian cultural groups do not have significant differences in terms of their cultural values of collectivism and uncertainty avoidance. Since the group-level comparison did not show significance on cultural differences within sample, we decided to analyze the potential influence of two specific cultural values from the individual level.

As it was mentioned in the introduction section of this thesis, several researchers have used cultural dimensions and scales in the individual level to understand the impact of personal cultural values on different behaviors (Mooij, 2015). For example, Yoo and Donthu (2002) investigated the impacts of individual cultural values (e.g., collectivism and uncertainty avoidance) on the level of marketing ethics of the university students. In addition, Lam (2007) explored the relationship between individual cultural values and consumers' proneness to brand loyalty. In these studies, the identification of cultural differences among consumers was not based on the regional or national factors but the individual scores of cultural dimensions. Our study is to understand within-Canada differences in terms of individual decision-making of GM food consumption, so we decided to follow the same concept of individual cultural values from the previous studies which is based on the individual scores. Specifically, the cultural comparison and the moderating analysis of cultural

values therefore depend on the differences between the group of individuals who score high on the cultural value and the group of individuals who score low on the cultural value.

The insignificant result of the comparison between Asian and Non-Asian groups are discussed later in the later discussion.

Moderating effects of cultural values

The proposed moderating effects of individualism (H8) and uncertainty avoidance (H10) on the process of attitude formation were tested using a concept from Baron and Kenny (1986). According to Baron and Kenny (1986), a clear moderating role of the proposed moderator variable is supported if the interaction term is a significant predictor of the dependent variable.

Baron and Kenny (1986) also assert that "it is desirable that the moderator variable be uncorrelated with both the predictor and the criterion (the dependent variable)" (p. 1174). Accordingly, we tested the bi-variate correlation coefficients among individualism, uncertainty avoidance, and attitude. The results indicate that the moderator variables are not significantly correlated with the dependent variable (see Table 5.10).

Table 5.10 Test of correlation between moderators and the dependent variable

	Attitude	Individualism	Uncertainty Avoidance
Attitude	1		
Individualism	-0.054	1	
Uncertainty Avoidance	-0.035	-0.197***	1

* p<0.1; ** p<0.05; *** p<0.01

Based on the above discussion, we tested the proposed moderating effects of individualism (H8) and uncertainty avoidance (H10) using the regression Model 3.

Attitude = β4×Perceived Personal Benefits + β5×Perceived Industry Benefits + β6× Perceived Social Benefits + β7×Perceived Risks + β8×Perceived Personal Benefits×Individualism + β10×Perceived Risks×Uncertainty Avoidance + error …… (Model 3)

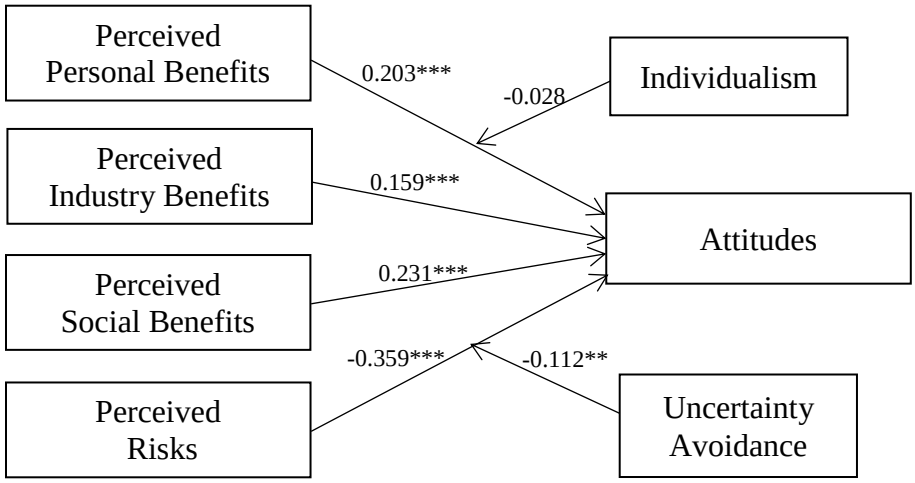
The results of this regression analysis are reported in Table 5.11 and Figure 5.3.

Table 5.11 Regression analysis of Model 3

Model	IV	Unstandardized Coefficient		Standardized Coefficient	T	p
		β	Std. Error	β		
3	Constant	2.380	0.204		11.640	<0.001
	Perceived Personal Benefits	0.239	0.044	0.203	5.388	<0.001
	Perceived Industry Benefits	0.140	0.031	0.159	4.581	<0.001
	Perceived Industry Benefits	0.239	0.040	0.231	5.985	<0.001
	Perceived Risks	-0.369	0.060	-0.359	-6.141	<0.001
	PPB×Individualism	-0.009	0.010	-0.028	-0.916	0.360
	PR×UA	-0.027	0.013	-0.112	-2.093	0.037

DV: Attitude

Figure 5.3 Antecedents and moderators of consumer attitudes



*p<0.1; **p<0.05; ***p<0.01

The results of Model 3 do not support H8 (β= -0.028, p=0.360) and suggest that the degree of individualism does not have a significant moderating effect on the relationship between perceived personal benefits and perceived attitudes. In other words, perceived personal benefits is a significant antecedent for consumer attitude for all consumers, regardless of their cultural values.

The results of Model 3 support H10 (β=-0.112, p=0.037). Specifically, the interaction between uncertainty avoidance (UA) and perceived risk has a significant and negative impact on attitude. To better understand this result, we contrasted groups of samples whose scores on UA are higher or lower than the mean score (M= 3.89). This analysis revealed that the correlation coefficient between perceived risks and attitude is -0.775 among participants with higher UA scores but -0.714 among those with lower UA scores. This indicates that the negative relationship between perceived risks and consumer attitude is stronger among the group of consumers with higher levels of UA. In other words, perceived risks have stronger negative impacts on attitude for consumers who have higher levels of uncertainty avoidance. The adjusted R-squared value of Model 3 is 0.745.

Following the same logic, the moderating effect of collectivism on the relationship between subjective norms and purchase intention (H9) was tested using Model 4. The relationships among the constructs in the model are visually described in Figure 5.4.

Purchase Intention =β1×Attitude + β2×Subjective Norm + β3×Perceived Behavioral Control + β9×Subjective Norm×Collectivism +error …… (Model 4)

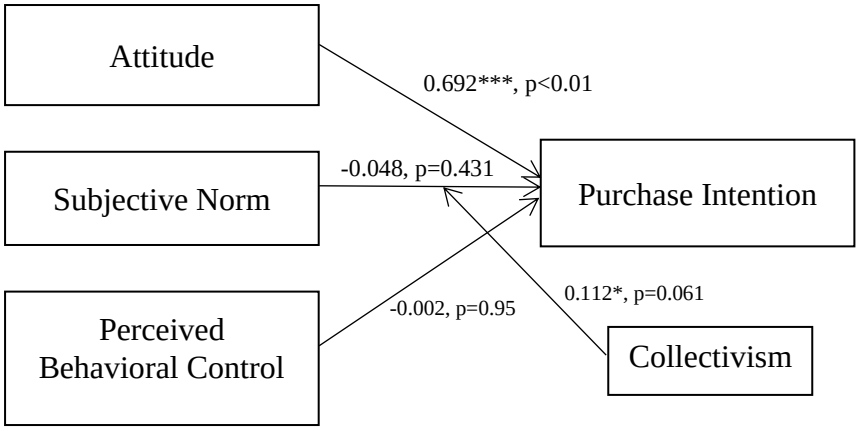
The results of this regression model are reported in Table 5.12.

Table 5.12 Regression of Model 4

Model	IV	Unstandardized Coefficient		Standardized Coefficient	t	p
		β	Std. Error	β		
4	Constant	0.769	0.167		4.618	<0.001
	Attitude	0.781	0.041	0.692	19.142	<0.001
	Subjective Norm	-0.062	0.079	-0.048	-0.788	0.431
	Perceived Behavioral Control	-0.003	0.043	-0.002	-0.063	0.950
	SN×Collectivism	0.038	0.020	0.112	1.879	0.061

DV: Purchase Intention

Figure 5.4 Antecedents and moderators of purchase intentions



*p<0.1; **p<0.05; ***p<0.01

The results suggest a weak positive moderating effect (β= 0.112, p=0.061). The adjusted R-squared value of the model is 0.509.

5.2.5 Additional analysis

Consumer willingness to pay for GM foods versus willingness to pay for GM foods with consumer benefits

To better understand the purchase decisions made by different groups of consumers, our online survey measured consumers' willingness to pay (WTP) for GM foods twice – before and after the discussion of various consumer benefits.

Before the discussion of the benefits and risks of GM foods, participants were asked how much they would like to pay for a loaf of GM-based bread if the similar style non-GM bread was sold at $3.00 (Q3). We used answers to this question as the baseline willingness to pay for GM foods (WTP1) that reflects most consumers' current willingness to pay considering the current market information the consumers might already have. In a later portion of the questionnaire (Q9), after a discussion of the various consumer benefits and risks associated with GM foods, participants were asked about their willingness to pay for a loaf of GM based bread *with enhanced nutrients*

compared to the same GM-free product. Here, "enhanced nutrients" is used as a possible example of consumers' benefits of GM food consumption. This second variable is defined as WTP2. For a participant who chooses "would not buy", the value is 0. Therefore, participants who do not choose "would not buy" in both Q3 and Q9 are considered as acceptors of GM foods because they would pay a certain amount of money to buy GM foods with or without the mention of consumers' benefits. On the other hand, participants who chose "would not buy" for at least one WTP question indicate they might not want to pay for GM foods under certain conditions and therefore are considered as rejecters of GM foods. First, we separated acceptors from rejecters using the filter "WTP1×WTP2>0", with a resulting 326 acceptors and 189 rejecters. Next, we did some further analysis on the data provided by the 326 acceptors. The following table shows the mean and standard deviation of WTP1 (willingness to pay for regular GM foods) and WTP2 (willingness to pay for GM foods with extra health benefits).

Table 5.13 Paired t-test of consumer willingness to pay for GM foods (WTP1) versus GM foods with consumer benefits (WTP2)

	Mean	N	SD
WTP1	2.773	326	0.45170
WTP2	2.9463	326	0.43704

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	WTP2 - WTP1	0.17331	0.30234	0.01674	0.14037	0.20626	10.350	325	<0.001

As shown in Table 5.13, the mean values of both WTP 1 and WTP2 of the GM food acceptors are lower than 3.00, which is the price of the similar non-GM product. This shows that consumers willing to buy both GM1 and GM2 food products would prefer a price discount as compared to the non-GM alternatives. In addition, the result of the paired sample t-test shows WTP2 (M= 2.9463, SD= 0.43704) is significantly higher than WTP1 (M= 2.773, SD= 0.45170); t (325) = 10.350, $p<0.01$. This indicates that consumers ask for a lower price on both GM1 and GM2 foods but are willing to pay more (0.173 as the difference of means) for GM2 food products that provide more direct personal benefits than GM1 foods (no benefits mentioned).

Comparison between acceptor group and rejecter group

We compared these two groups of consumers in our survey. The first group of consumers expressed "Would not buy" GM2 foods at any price. Therefore, their WTP2 is 0. We labeled them as rejecters of GM2 foods. The second group of consumers expressed a willingness to pay for GM2 foods greater than 0. We labeled them as acceptors of GM2 foods. We also compared the demographic characteristics of the two groups using independent sample t-tests.

Table 5.14 Independent t-tests of acceptors and rejecters of GM2 foods

Variables	WTP2	N	Mean*	SD	Sig. (p) Equal variance not assumed
Age	Acceptors	363	3.573	1.570	<0.001
	Rejecters	152	4.329	1.495	
Gender	Acceptors	363	1.477	0.548	<0.001
	Rejecters	152	1.697	0.651	
Income	Acceptors	363	4.573	1.694	0.603
	Rejecters	152	4.664	1.870	
Education	Acceptors	363	5.391	1.324	0.152
	Rejecters	152	5.204	1.359	
Collectivism	Acceptors	362	3.179	0.736	0.059
	Rejecters	150	3.030	0.838	
Uncertainty Avoidance	Acceptors	362	3.904	0.577	0.477
	Rejecters	150	3.861	0.626	
Attitude	Acceptors	363	3.294	0.785	<0.001
	Rejecters	152	1.827	0.675	

*This is the mean of scales in the questionnaire. e.g., Age: 1= age range of 18-25; 6= age range of 66 or above. Gender: 1= male; 2= female

The results in Table 5.14 indicate that significant differences exist between the acceptors and rejecters of GM2 foods. Specifically, the rejecters tend to be older, which is consistent with findings of a previous study (Onyango, 2004). In addition, our data show that the rejecters are more likely to be female. This pattern was also found in a study in Europe (Moerbeek & Casimir, 2005). Our results indicate no significant differences between the rejecter and acceptor groups in terms of education level or family income. For psychographic variables, our data show that accepters tend to have higher scores on attitude and marginally higher scores on collectivism. There is no significant difference between the groups with respect to uncertainty avoidance.

Participants converted by GM2 foods

In addition to the above two groups (clear accepters and rejecters of GM foods), 33 participants (6.4% of the total) chose not to buy for GM1 products but would buy GM2 products after the mention of direct personal benefits (enhanced nutritional value) for different prices. This shows that a small group of consumers could be converted with education of direct personal benefits from GM foods. Interestingly, a small number of participants (n=4) also reported they were willing to purchase GM1 products but not GM2 products.

The possible mediating effect of consumer attitude on the relationship between subjective norm and purchase intention of GM foods.

Although our findings do not support a significant direct relationship between subjective norms and purchase intentions of GM foods, we are still interested in possible connections between subjective norms and other constructs in the proposed TBP-based model. In a study focusing on consumers' behavioral intentions in the restaurant industry, Kim et al. (2013) found no significant relationship between subjective norm and behavioral intention but a significant indirect effect of subjective norm through attitude. This study further confirmed that attitude could act as a mediator within the relationship between subjective norms and the intention to read information from a menu. Following this finding, we further tested the possible mediating effect of the consumers' attitude toward GM foods on the relationship between subjective norms and purchase intention of GM foods (see Figure 5.5). We applied Model 4 from the Hayes' PROCESS Macro (Hayes, 2013) to conduct this test.

Figure 5.5 Test of mediating relationship

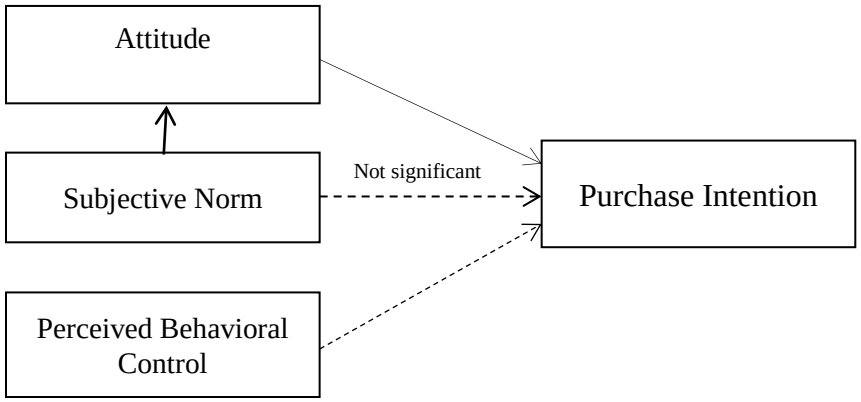
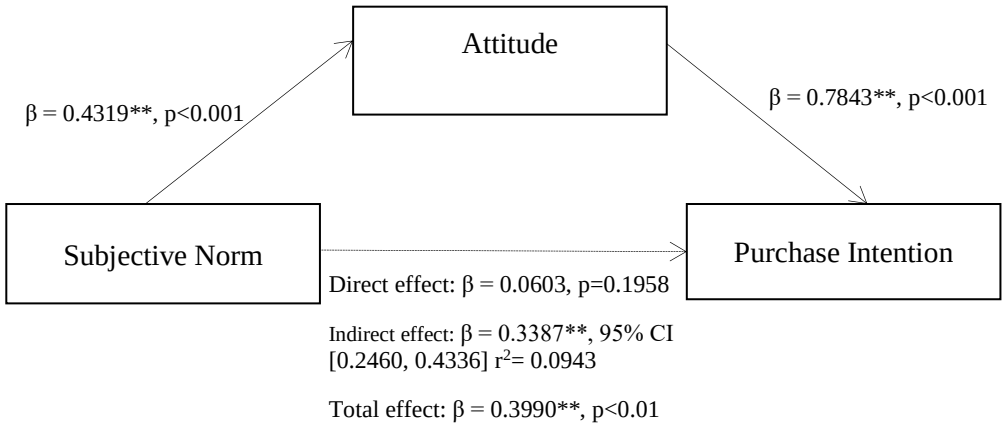


Figure 5.6 Mediating relationship



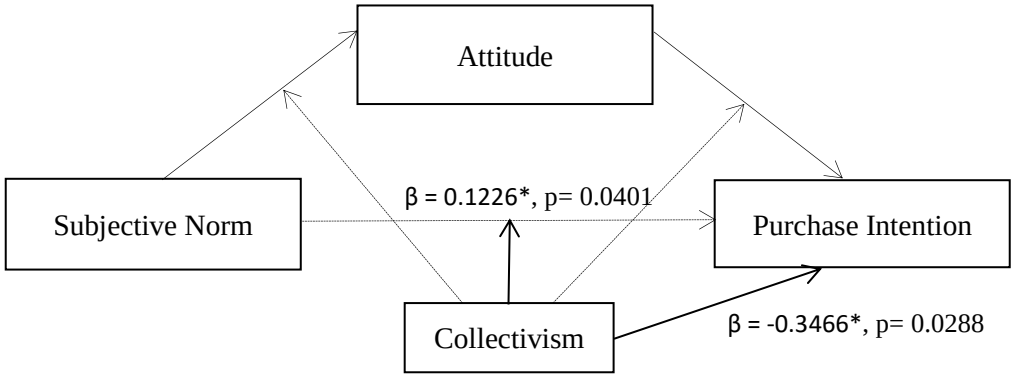
** p<0.01, *p<0.05

As shown in Figure 5.6, the subjective norm to GM foods is a significant predictor of consumers' attitude (β = 0.4319, p<0.001), while attitude towards GM foods has a significant relationship with purchase intention (β = 0.7843, p<0.001). The results of the mediation analysis show a fully-mediated as well as significant indirect effect (β = 0.3387**, 95% CI [0.2460, 0.4336], r^2= 0.0943) on consumers' purchase intentions of GM foods through their attitudes toward GM foods. This echoes similar findings by Kim et al. (2013) that attitude acts as a mediator between subjective norm and behavioral intention. More importantly, this result also reveals a significant indirect positive relationship of subjective norm to consumers' purchase intention of GM foods. It further implies that a positive subjective norm on GM foods would help consumers to achieve more positive attitudes toward the products, and therefore promote their purchase intention of GM foods.

The potential moderating role of collectivism

As indicated in the earlier analysis, cultural collectivism has a significant moderating effect. Following the above mediation analysis, collectivism was added back into the model to test its moderating effects using Hayes PROCESS model (Model 59). The result shows that collectivism has a significant and negative influence on purchase intention (β=-0.3466, p=0.0288) and a significant and positive moderating effect on the relationship between subjective norm and purchase intention (β=0.1226, p=0.0401; see Figure 5.7).

Figure 5.7 Moderating effect of collectivism



** p<0.01, *p<0.05

6. DISCUSSION AND CONCLUSION

The results of this study lead to several interesting findings with respect to how consumers formulate their attitudes and purchase intentions toward GM foods and considering the impacts of different cultural values. A number of previous studies explored consumer acceptance of GM foods using an extended Theory of Planned Behavioral model, but few considered the role of consumers' cultural values in the process. This study provides empirical evidence to show that attitude is a significant factor determining consumers' purchase intention of GM foods, but specific cultural values (e.g., uncertainty avoidance) play a significant moderating role in shaping consumers' attitudes toward GM foods. Consistent with prior studies on consumer acceptance of GM foods, our study shows that consumers' attitudes are significantly predicted by their perceptions of benefits and risks (Costa-Font et al., 2008). Moreover, our study provides support with respect to the perception of consumers' personal benefits and its implications in future studies.

First, our data support H1, which confirms that attitude is a significant predictor of consumers' purchase intention of GM foods ($\beta = 0.696$, $p<0.001$ in Model 1; $\beta = 0.692$, $p<0.001$ in Model 4). This finding is in line with previous studies (e.g., Cook et al., 2002; Spence & Townsend, 2006). Interestingly, unlike Cook et al.'s (2002) findings from New Zealand, our data do not support H2 and H3 regarding subjective norms and perceived behavioral control being significant predictors of the purchase intention of GM foods. One potential explanation for this difference is the selection of measuring items and scales. As shown in the pilot study, the items adapted from Spence and Townsend (2006) did not perform well. Also, the results of the Canadian consumer survey suggest that the alternative items adapted from Ruiz-Mafe et al. (2016) might still not be ideal for measuring subjective norms. These results indicate the complexity of measuring subjective norm in the context of GM foods, which is also highlighted by Prati et al. (2012). In addition, the insignificant relationship between subjective norms and purchase intention might indicate that Canadian consumers either do not know or do not care about other's thoughts and beliefs with respect to their purchase decisions of GM foods. Our findings suggest a need to conduct more studies on the topic of perceived behavioral control. Because GM foods are voluntarily labeled in Canada (Public Service and Procurement Canada [PSPC], n.d.), it is possible

that consumers do not have enough information to identify if the food products they want to buy are GM based or not. Therefore, consumer's perceptions of the behavioral control with respect to either purchasing or avoiding GM foods might have been primarily based on guesswork, and hence are unreliable. The market environment in Canada is different from other jurisdictions where significant relationships are found in previous studies, such as New Zealand (Cook et al., 2002) and the UK (Spence & Townsend, 2006). In these two countries, labelling of GM foods is mandatory (Food Standards Australia & New Zealand, 2016; The Food Standards Agency UK, 2013). In addition, the insignificant impact of perceived behavioral control on purchase intention might be associated with both purchasing and avoiding GM foods.

Second, the results also support H4-H7, which indicates that perceived personal benefits, perceived industry benefits, perceived social benefits, and perceived risks are four significant antecedents to consumer attitudes toward GM foods. In line with previous studies (e.g., Chen, 2008; Prati et al., 2012), our findings suggest that perceived benefits and perceived risks are vital factors for predicting consumers' attitudes toward GM foods. Specifically, we separated the perceived benefits into three types and found that consumers perceived personal benefits from GM foods and considered it when forming their attitudes toward GM foods. This finding is consistent with some other studies (e.g., Hossain et al., 2003) and shows the value of providing direct benefits to consumers as potential product development strategies for the new generation of GM foods. Our findings also suggest that perceived risks have the strongest negative impact (β=-0.462, $p<0.01$ in Model 2; β=-0.359, $p<0.01$ in Model 3) on Canadian consumers' attitude toward GM foods. Meanwhile, it is interesting to note that perceived social benefits have the strongest positive connection (β=0.217, $p<0.01$ in Model 2; β=0.231, $p<0.01$ in Model 3) with consumers' attitude towards GM foods among the three types of perceived benefits. This indicates that Canadian consumers might evaluate GM foods highly based on the perception of risk in their personal shopping decisions but are also aware the positive side of GM foods and technologies from the perspective of social welfare. Our findings are slightly different from those of a recent consumer report on GM foods in Canada (Gregg et al., 2016) that shows Canadian consumers are less influenced by potential social benefits of GM foods and technologies.

Third, the study shows that specific cultural values (e.g., uncertainty avoidance) have a moderating effect in shaping the process of consumers' acceptance and purchase intentions with

respect to GM foods. In particular, H10 is supported. While our data did not provide support for differences by ethnicity, our result did support that individuals who score high on uncertainty avoidance would consider risks of GM foods more seriously. This therefore suggests that degree of uncertainty avoidance acts as a significant moderator between risk perceptions and consumer attitudes in the context of GM foods. This finding also indicates the possibility of extending the Theory of Planned Behavior (Ajzen, 1991) with Hofstede's cultural dimension theory (Hofstede, 1984) to explore consumer acceptance of GM foods. Given that Costa-Font & Gil (2009) show the influence of perceived benefits and risks on attitudes towards GM foods are diverse among consumers from different countries, our findings provide evidence to indicate that even within a country, and consumer personal characteristics vary. Some consumers are more concerned about the potential risks associated with GM food because they prefer to avoid the uncertainties associated with it.

Our study did not provide support for moderating effect of individualism on the relationship between perceived personal benefits and attitude (H8 was not supported). This could be interpreted that personal benefits are an important antecedent to consumer attitude, regardless of the consumers' value on collectivism. Meanwhile, the result indicated a weak moderating effect (β=0.112, p=0.061) suggesting that among the collectivistic consumers, the relationship between subjective norms and purchase intention of GM foods is stronger, providing support for H9.

In addition to the above findings, results from the additional analysis of acceptors and rejecters of GM foods also suggest the following insights: accepters of GM foods are willing to buy both GM1 and GM2 products at lower prices compared to GM-free products. This result is consistent with several previous studies conducted in other countries (Spence & Townsend, 2006). Moreover, the data also show that accepters are willing to pay a significantly higher average price for GM2 products with a direct personal benefit such as enhanced nutrients than the GM1 product without the same benefit. Furthermore, the data indicate that a small group (n=33) of consumers change their decision after the mention of direct personal benefits of GM2 products. These results further confirm the early findings of our study, specifically that increased perceived personal benefits would positively influence consumers' attitude and purchase intention towards GM foods. The data also show that female and older consumers are more likely to be rejecters of GM foods.

In the further investigation of three constructs of behavioral intention in the Theory of Planned Behavior, our findings are consistent with Kim et al. (2013) and show that subjective norms have a significant indirect effect on consumers' purchase intention, which is fully mediated by consumers' attitudes. In other words, our study demonstrates that subjective norms also act as a significant antecedent of consumer attitude toward GM foods.

In addition to the above discussion, we also noticed that another possible explanation for some of the insignificant effects in the model could be the use of multiple behaviors in the model. As suggested by Ajzen (2002), the behavior should be clearly defined and consistent in the TPB questionnaire. In this study, we were interested in consumers' behavioral intention that refers to purchase intention of GM foods, specifically purchasing or avoiding GM foods. Therefore, the attitude component in the TPB model is intended to be attitude with respect to purchasing GM foods. However, we followed a published study (Spence & Townsend, 2006) in the UK that applied *Attitude to the behavior of GM food* as the attitude component in the TPB model. Spence and Townsend (2006) explained that no specific consumer behavior was measured in TPB studies because GM food products were not available in the UK at that time. Based on this situation and the previous literature, they further suggest that attitudes toward GM food behavior could be measured by consumers' evaluation of GM technology and willingness to pay (Spence & Townsend, 2006). The same concept and items were also cited and applied in several later studies (Chen, 2008; Prati et al., 2012) as the measurement of *Attitude towards GM food* in the TPB model. Given that the regulation of the production and consumption of GM food is different in the EU vs. North America, we believe that identifying and measuring specific consumer behaviors of GM food in the TPB model with Canadian consumers is possible and will increase the reliability of the results of future TPB studies.

Similarly, insignificant effects of the subjective norms could also occur due to potential measurement errors. As indicated by the definition of subjective norms from Ajzen (2002, 2015b), the measurements of subjective norms should reflect the perceptions of social pressure on the *future* intentions or actions. Although the items adopted from Ruiz-Mafe et al. (2016) have an acceptable level of reliability, the items are more related to the perception of subjective influences after purchasing GM foods than before the action (e.g., It is important to me that people support my choice of GM foods). In fact, we did use the items focusing on the subjective influence of intent

future behavior (before the purchasing of GM food) in the pilot study. However, such items (e.g., My family and friends will think negatively of me if I buy GM foods) had low internal consistency (Cronbach's $\alpha = 0.297$). This problem of reliability is also mentioned by Ajzen (2002) and should be addressed in future studies. To solve this problem, Ajzen (2002) suggests including a question to address descriptive norms (e.g., If important others will also perform the same behavior?) when measuring subjective norms.

It is also worth to note that our data did not show significant differences on the cultural dimensions of collectivism and uncertainty avoidance between Asian and Non-Asian groups. One possible explanation is associated with the processes of individual's cultural adaptation and acculturation (Kim, 2001; as cited from Croucher & Kramer, 2017). According to Kim (2001), cultural adaptation can be defined as "the dynamic process by which individuals, upon relocating to new, unfamiliar, or changed cultural environments, establish (or re-establish) and maintain relatively stable, reciprocal, and functional relationships with those environments" (p. 31). This definition indicates the possible influences of dominant cultural values on individuals from other minority cultural groups. Meanwhile, Croucher and Kramer (2017) argue that some fused intercultural values can be established in a two-directional cultural fusion process. Therefore, it is possible that Canadians with Asian cultural backgrounds do share some similar cultural beliefs and values with Canadians from other non-Asian backgrounds, especially after experiencing the long-term cultural adaptation process living together in Canada. In addition, the results further remind us of the context of using Hofstede's cultural dimension theory.

Finally, our data suggest that consumer behaviors and their individual cultural values are highly diversified within a nation, and the cultural segments may not strictly follow that of their original cultural backgrounds (such as Asian) and ancestors. Accordingly, our findings indicate that individual scores on cultural dimensions may be a useful indicator of personal traits, hence can be applied to understand within-nation differences associated with consumer cultural segments in the future studies.

Implications of the findings

Based on established research on consumers' acceptance of GM foods using the TPB model (Prati et al., 2012; Spence & Townsend, 2006), our study further points out the moderating role of one of Hofstede's cultural dimensions—uncertainty avoidance—within the process of consumer

attitude formation. It provides a possible theoretical explanation for the different influences of perceived benefits and perceived risks on consumer's attitudes toward GM foods from the cultural differences perspective. This study also further enriches the understanding of the impacts of perceived benefits and perceived risks on consumers' attitude toward GM foods. While perceived risks have the strongest influence on the attitude, different types of perceived benefits are also essential for predicting consumers' attitudes toward GM foods. The integrated theoretical model developed in this study could be revised and applied in future research to further explore the topic of consumers' acceptance of GM foods in other contexts (e.g., cross-country comparison).

Also, we hope that some of the insignificant results obtained while applying the TPB model will not only inform other researchers about the importance of using proper items in the measurement of TPB constructs but also remind them to note the potential impacts of different practical contexts (regulation and availability) of GM foods when testing the conceptual model.

From a managerial perspective, findings of the study also provide evidence and knowledge to assist marketers and product managers build more effective strategies regarding product development and communication, not only for the domestic market but also overseas markets. Specifically, the study supports the potential value of providing clear consumer benefits and considering the different cultural values of consumer groups in the R&D and marketing operations of future GM food products (e.g., GM2 foods). The study also points out that a perception of greater direct personal benefits is associated with more positive attitudes toward GM foods in Canada. In other words, most consumers more easily perceive risks from GM food consumption but it is still possible to influence consumers' attitudes and purchase decisions by communicating perceived benefits. Therefore, the food and agricultural industries should have confidence in following the ongoing trend from GM1 products to GM2 products, which provide more direct personal benefits such as enhanced nutritional value to consumers. Moreover, the study also suggests that marketers should consider the cultural differences of their audience when developing communication and education strategies for both domestic and international markets. For example, our results show consumers with a higher level of uncertainty avoidance in other countries might also be highly sensitive to the perceived risk of eating GM foods. Therefore, a different strategy is required when speaking to these consumers about the potential risks of GM foods. More importantly, it also supports marketers in the Canadian food and agricultural industry who want to introduce their GM-

based products to consumers in other countries (e.g., China) based on a culturally specific segmentation strategy. More importantly, our study suggests that such culture-based consumer segmentation may not only depending on where the consumers originally come from, but also how their individual value system are interacting with the environment they are current living. Finally, the findings also remind marketers to note the significant impact of subjective norms from consumers' social networks, such as families, friends, and colleagues, on the process of consumers' attitude formation towards GM foods. In the long run, GM food companies must gain a deeper understanding of the various subjective norms of GM foods in their specific target markets. The findings of our study might support marketers with respect to the formation of effective consumer segmentation strategies and help them find the correct audience for GM food information in Canada and beyond.

From a political point of view, our findings also provide meaningful information to support policymakers to build future regulations and policies on GM foods and labeling. Our study results suggest it is reasonable for GM food industries to convert from a producer benefits-oriented development strategy to a new consumer benefits-oriented development strategy to deal with the challenges of public acceptance of GM foods. However, this potential change from producer-oriented strategy to consumer-oriented strategy might not be successful without support from the government. In line with the findings of the Health Canada report (Gregg et al., 2016), our study suggests that GM food regulators in Canada can consider providing more standardized guidelines to encourage food and agriculture manufacturers to launch more new generations GM products to the market with different direct consumer benefits. If this were to happen, more consumers might understand why they should buy GM products over other alternatives. In addition, it is worthwhile for the government to evaluate the need for increased transparency of GM foods and technology to assist consumers' informed decisions about consumption of GM foods. The advantages and disadvantages of the voluntary labeling of GM foods depend on the target markets and audiences.

Limitations and future study

This study has several limitations. First, although our research intended to obtain a dataset that accurately reflected Canadian consumers to a reasonable degree, the sample is not a representative sample. Accordingly, the findings still cannot be generalized to all consumers in Canada due to possible biases related to sample selection and limited sample size.

Second, certain constructs in our model (e.g., subjective norm and perceived behavioral control) have not been well established. The existing measurement scales have produced mixed results in prior studies (Hess et al., 2016) and there might be better choices to improve the reliability of construct measurements in future studies. For example, Prati et al. (2012) suggest that measuring only one side of behavioral control (e.g., avoid eating GM foods) might be better with respect to determining GM food consumption. Future studies could investigate the efficacy of different versions and operationalization of these constructs.

Third, culture is a complicated topic that includes many different dimensions. Our study only focuses on two specific dimensions (individualism/collectivism and uncertainty avoidance) within the six dimensions of Hofstede's Cultural Dimensions Theory, but the other four (power distance, masculinity, long-term orientation, and indulgence) might also play roles in consumers' decision-making process with respect to GM food consumption. In addition, we have used a single group of six items adapted from Soares (2005) to measure the degree of both collectivism and individualism. Although it has been common to consider individualism as the opposite of collectivism, some researchers have argued in recent years that individualism/collectivism might be a multidimensional construct. Therefore, the two variables should be measured separately by different groups of elements (Chen & West, 2008). The degree of individualism could be more reliably determined using alternative measurement strategies. Thus, more studies are needed to confirm the potential role of individualism on the relationship between perceived personal benefits and consumers' attitudes toward GM foods.

Finally, although the proposed integrated model can be used to explain acceptance of GM foods with Canadian consumers, this conceptual model needs to be further replicated for different consumer groups with more differentiated and stabilized cultural values from more than one country. The selection of respondents for this study was based on the understanding that Canadian consumers have different cultural backgrounds and cultural values. However, an individual's cultural values can change depending on personal life experiences as well as other factors such as consumer knowledge and trust. Therefore, more research should be conducted to assess the value of this integrated conceptual model.

To address these limitations, future studies should consider increasing the sample size and extending sample selection to consumers in other countries. To better understand how this new

conceptual model works in the context of the international marketing of GM foods, applying the model to cross-country studies is also a reasonable direction for future work. Also, future studies can improve upon the validity of the model and reliability of the data by applying other items and scales. For example, our results suggest that individualism and collectivism can be measured separately by two independent variables. Moreover, future studies should also consider incorporating more cultural dimensions and other potential variables into the model to improve its application in the context of GM food purchasing. As mentioned earlier, consumers' food choice is a complicated and highly personalized decision-making process that might not be fully characterizable by a questionnaire-based consumer survey. To further understand the impacts of cultural values on consumers' acceptance of GM foods, applying a mixed-methods approach that involves the collection of both quantitative and qualitative data could be considered for the future studies.

In conclusion, our study attempted to contribute to the existing knowledge on the consumer acceptance of GM foods by applying an integrated framework. It provides a potential theoretical tool to better understand consumer reactions to GM food products and technologies considering the possible impact of diverse cultural backgrounds. Although the application of GM technology in food and agricultural production might be necessary for current and future business success, it is reasonable for food companies and marketers to consider consumer benefits and differences in their cultural values during the communication process, especially with respect to international food and agriculture marketing.

Given the complexity of consumer acceptance of GM foods as indicated by the results of this study, variables not included in our conceptual model might also have significant impacts on consumers' decision-making process with respect to GM food consumption. For example, our study seems to indicate that Canadian consumers still need more realistic information about GM technology and GM foods to support informed decisions. Future studies are needed to explore the impacts of potential factors related to transfer of information to consumers, such as the potential effects of mandatory GM labelling and consumers' trust in different information sources (types of media) within the process.

APPENDICES

Appendix A. Research Ethics Approval

UNIVERSITY OF SASKATCHEWAN

Behavioural Research Ethics Board (Beh-REB)

Certificate of Approval
Study Amendment

PRINCIPAL INVESTIGATOR	DEPARTMENT	Beh #
David D Zhang	Edwards School of Business	17-329

INSTITUTION(S) WHERE RESEARCH WILL BE CARRIED OUT
Canada

STUDENT RESEARCHER(S)
Yufei Huang

FUNDER(S)
SOCIAL SCIENCES AND HUMANITIES RESEARCH COUNCIL OF CANADA (SSHRC)
UNIVERSITY OF SASKATCHEWAN - ALLIANCE FOR FOOD AND BIOPRODUCTS INNOVATION (AFBI)

TITLE
Understanding Consumer Acceptance of Genetically Modified Foods in Canada and Beyond: An Exploration of Culture's Influence on Consumer Planned Behaviors

APPROVAL OF	APPROVED ON	CURRENT EXPIRY DATE
Revised Funder(s) Revised Questionnaire	19-Oct-2017	21-Sep-2018

Full Board Meeting ☐ Delegated Review ☒

CERTIFICATION
The University of Saskatchewan Behavioural Research Ethics Board (Beh-REB) is constituted and operates in accordance with the current version of the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2 2014). The University of Saskatchewan Behavioural Research Ethics Board has reviewed the above-named research project. The proposal was found to be acceptable on ethical grounds. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to this research project, and for ensuring that the authorized research is carried out according to the conditions outlined in the original protocol submitted for ethics review. This Certificate of Approval is valid for the above time period provided there is no change in experimental protocol or consent process or documents.

Any significant changes to your proposed method, or your consent and recruitment procedures should be reported to the Chair for Research Ethics Board consideration in advance of its implementation.

ONGOING REVIEW REQUIREMENTS
In order to receive annual renewal, a status report must be submitted to the REB Chair for Board consideration within one month prior to the current expiry date each year the study remains open, and upon study completion. Please refer to the following website for further instructions: *http://research.usask.ca/for-researchers/ethics/index.php*

Vivian Ramsden, Chair
University of Saskatchewan
Behavioural Research Ethics Board

Appendix B. Participant Consent Form for the Pilot Study

Participant Consent Form Edward School of Business
University of Saskatchewan

Project Title: Understanding consumer acceptance of genetically modified foods in Canada and beyond: An exploration of culture's influence on consumer planned behaviors

Principal Investigator and Supervisor: Dr. David Di Zhang, Associate Professor, Department of Marketing & Management, Edward School of Business. E-mail: zhang@edwards.usask.ca Phone: 306-9965920

Student Researcher: Yufei Huang (Bob), Graduated Student from MSc. Marketing program, Edwards School of Business. E-mail: yuh515@mail.usask.ca

Purpose(s) and Objective(s) of the Research:

- Given the fact that genetically modified food is playing an increasingly important role in the international food supply chain, the public acceptance of GM foods is still a controversial issue globally. This study aims to get a better understanding of consumer acceptance towards genetically modified food with the influences of culture. The first objective of this research is to apply the Theory of Planned Behavior to investigate consumer attitude formation and change in the context of accepting GM food. The second objective is to examine how various cultural dimensions influence consumer attitudes and modifies the relationships in the planned behavior framework.

Procedures:

- The research is based on an anonymous consumer survey. Participant is expected to fill a questionnaire by indicating their agreement or disagreement with different groups of statements. This document gives basic information about the research and asks consent from each participant to finish and submit the questionnaire. (Please check the attached document for the detailed information on the survey questions)
- The potential participants of the study are proposed to be any full competent adults (older than 18). The proposed sample size of the study is about 600-700. It will less than 20 minutes to finish the questionnaire
- Please feel free to ask any question regarding the procedures and goals of the study or your role.

Funded by: Part of this research was funded by Alliance for Food and Bio-products Innovation (AFBI) at the University of Saskatchewan

Potential Risks:

- This survey is anonymous; although participants are expected to answer questions about the demographic information (e.g. gender, age, education level and income), the data will only be used for research purpose. The study is considered to be minimal risk.

Participants should not have any risk of psychological or emotional harm or discomfort to answer the questionnaire. Legal repercussions, social repercussions, and physical harm or discomfort should not involve in the study.

Potential Benefits:

- First, the results of the survey in Canada will partially reflect the consumer attitudes and general acceptance of GM foods. It might be used as research evidence to help local food & agriculture business or retailers to improve their marketing and communication strategies when targeting local consumers. Therefore, participants of this study might have better food choices (either GM or GM-free options) in the future. Second, overall findings of this cross-culture comparison study between Canada and China is proposed to provide more insights about Chinese consumers to Canadian food and agricultural companies who want to target or extend Chinese food market. Finally, it may provide new knowledge to academia in terms of consumer acceptance of GM foods in the context of international food trade market.

Confidentiality

- Only the principal researcher, project supervisor, and other two committee members have rights to access the original anonymous data.
- The principal investigator takes the responsibility of data storage (e.g., electronic and paper documents). The password-protected portable device (a flash drive U-disk) is applied to transport data from the collection site. Only the principal investigator has the password. The electronic documents used in the study will be stored in the password-protected computer files. Data analysis will be conducted by the researchers on secure computers on the University campus.

Right to Withdraw:

- Your participation is voluntary and you can answer only those questions that you are comfortable with. You may withdraw from the research project for any reason, at any time without explanation or penalty of any sort.
- If you do not want to answer a specific question in the questionnaire, you can check "I don't know" or ignore the question.
- Once the survey is submitted it cannot be withdrawn as no identifiers are attached to the survey.

Follow up:

- To obtain results from the study, please contact the researcher via email (information provided above) to indicate your interest. Summarized results will be provided once they became available.

Questions or Concerns:

- If you have any questions or concerns about the research, please contact researcher using the information at the top of page 1.
- This research project has been approved on ethical grounds by the University of Saskatchewan Research Ethics Board. Any questions regarding your rights as a participant may be addressed to that committee through the Research Ethics Office ethics.office@usask.ca (306) 966-2975. Out of town participants may call toll free (866) 966-2975.

IMPLIED CONSENT FOR SURVEYS

- By completing and submitting the questionnaire, **YOUR FREE AND INFORMED CONSENT IS IMPLIED** and indicates that you understand the above conditions of participation in this study.
- As you complete the survey, please do not put your name or any other identifiable information on the form. Please refrain from revealing your personal identity when you provide "additional comments" at the end of the survey.
- Once you have completed the survey, please put it into the envelope provided, seal it, and return it to the student researcher.
- We appreciate that you providing your opinions to help our research. Please respect your fellow students' privacy and confidentiality of their opinions. Avoid engaging in debate or discussion of this survey after completion.

Thank you.

Appendix C. Questionnaire for the Pilot Study

Consumer Attitude Questionnaire on Food Choices and Culture

1. The following statements pertain to the dominant values in the culture. Please indicate your degree of agreement or disagreement on each one. Between 1= strongly disagree and 7= strongly agree. **Please check the number that best shows your position.**

	Strongly Disagree						Strongly Agree	
	1	2	3	4	5	6	7	Don't know
Individuals should sacrifice self-interests for the group.								
Individuals should stick with the group even through difficulties.								
Group welfare is more important than individual rewards.								
Group success is more important than individual success.								
Individuals should only pursue their goals after considering the welfare of the group.								
Group loyalty should be encouraged even if individual goals suffer.								
It is important to have instructions spelled out in detail so that I always know what I'm expected to do.								
It is important to closely follow instructions and procedures.								
Rules and regulations are important because they inform me of what is expected of me.								
Standardised work procedures are helpful.								
Instructions for operations are important.								

2. Please indicate your intention to buy genetically modified (GM) foods between **1= Definitely Avoid** and **7= Definitely Buy**.

	Definitely Avoid						Definitely Buy	
	1	2	3	4	5	6	7	Don't know
If GM foods were available in the food stores, I would:								

3. Under what condition (s) I would consider buying GM foods. (You can check **more than one option** that works for you from the following list.

□ If it provides an enhanced amount of nutrients.
□ If it leads to less use of artificial chemicals.
□ If it is significantly cheaper.
□ If it tastes better.
□ If it is more environmentally friendly.
□ If it provides more foods to meet the world's growing needs.
□ If it is beneficial to the local economy.
□ If it is certified by the government.
□ If it is suggested by families and friends.
□ I don't consider buying GM foods no matter what.

4. If a loaf of bread made from non-GM wheat sells at $ 3.00 at your local food store, how much would you pay for the similar bread that is made from GM wheat? (Please check one option from the following list)

□ $ 4.00 or more
□ $ 3.75
□ $ 3.50
□ $ 3.25
□ $ 3.00 (same price)
□ $ 2.75
□ $ 2.50
□ $ 2.25
□ $ 2.00 or less
□ Not going to buy

5. Please indicate your degree of agreement or disagreement on the following statement between **1= Strongly Disagree and 7= Strongly Agree.**

	Strongly Disagree						Strongly Agree	
	1	2	3	4	5	6	7	Don't know
GM foods are already on the market in Canadian stores								
I am knowledgeable about GM technology.								

6. Please indicate your opinion about the following questions between 1 and 7. You can use the scale and check the number that best shows your position.

	No Control						Complete Control	
	1	2	3	4	5	6	7	Don't know
How much control do you think you have over whether you can purchase or avoid GM foods?								
	Not Confident						Complete Confident	
How confident are you that it is possible to choose or avoid GM foods?								

7. Please indicate your degree of agreement or disagreement with the following statements between **1= strongly disagree and 7= strongly agree.**

	Strongly Disagree						Strongly Agree	
	1	2	3	4	5	6	7	Don't know
There is a clear public consensus on whether people should buy GM foods.								
My families and friends would think of me negatively if I buy GM foods.								
My purchase or avoidance behavior is influenced by my families and friends.								

8. Please indicate your opinion on the following question. Please **circle the number on each scale that best shows your position**.

   In general, I believe that the use of GM technology in food production is:

Very good ……..**Very bad**

1	2	3	4	5	6	7

Very right ……**Very wrong**

1	2	3	4	5	6	7

Very safe ……...**Very dangerous**

1	2	3	4	5	6	7

Very wise ……**Very foolish**

1	2	3	4	5	6	7

9. Please indicate your degree of agreement or disagreement with the following statements between **1= strongly disagree and 7= strongly agree.**

	Strongly Disagree						Strongly Agree	
	1	2	3	4	5	6	7	Don't know
GM foods can potentially provide enhanced nutrition.								
GM foods may use fewer chemicals, which would make the food safer.								
GM foods can result in better price because of the higher production.								
In general, applying GM technology in food production will provide benefits to agriculture and food industries								
Overall, applying GM technology to produce foods with higher productivity will provide benefits on maintaining the global food supply.								
Overall, applying GM technology to produce foods with less use of chemicals will provide benefits to the environment.								
	Strongly Disagree						Strongly Agree	
GM foods involve considerable health risks.								
GM foods posit considerable risks to the environment.								
GM foods raise considerable ethical risks or concerns.								

10. Please indicate your intention to buy genetically modified (GM) foods between **1= Definitely Avoid** and **7= Definitely Buy**.

	Definitely Avoid						Definitely Buy	
	1	2	3	4	5	6	7	Don't know
If GM foods on the market actually contain the beneficial attributes they promised, I would:								

11. If a loaf of regular non-GM bread sells for $ 3.00 at your local store, how much would you pay for the GM bread that contains enhanced nutrition?

□ $ 4.00 or more
□ $ 3.75
□ $ 3.50

□ $ 3.25
□ $ 3.00 (same price)
□ $ 2.75
□ $ 2.50
□ $ 2.25
□ $ 2.00 or less
□ Not going to buy

12. What is your gender?

□ Male
□ Female
□ Other. Please specify _____
□ Prefer not to say

13. What is your age?
□ 18-25
□ 26-35
□ 36-45
□ 46-55
□ 56-65
□ 66 or above

14. What is the highest level of education you have achieved?
□ Elementary School
□ Secondary School
□ Technical / College
□ University
□ Graduate Study

15. For comparison purpose only, which one of the following category best describes your monthly household net income?
□ Less than $1,000 per month
□ $1,001-2,000
□ $2,001-3,000
□ $3,001-4,000
□ $4,001-5,000
□ $5,001-6,000
□ $6,001-7,000
□ $7,001-8,000
□ $8,001-9,000
□ $9,001-10,000

□ More than $ 10,000

16. For comparison purposes only, please identify your ethnicity. _____.

17. Do you have any other comments on GM foods?

Thank you very much.

Appendix D. Invitation E-mail for the Online Consumer Survey

Dear member of the xxx research panel,

You are invited to participate in a survey on new, novel food items. This is an ethics-approved, University of Saskatchewan research project looking at how consumers make decisions toward food purchases.

Please rest assured that this is voluntary and your answers are completely confidential (this means that no individual will be associated with the survey's results - rather, all of the results will be combined to protect the confidentiality of each respondent).

The researchers at the University of Saskatchewan would like to thank you for your interest in their research and your participation.

xxx, Inc.

Appendix E. Participant Consent Form for the Online Consumer Survey

Dr. David Di Zhang
Associate Professor, Edwards School of Business
University of Saskatchewan
E-mail: zhang@edwards.usask.ca
Phone: (306) 966-2515
Yufei (Bob) Huang
M.A. Student, Edwards School of Business
University of Saskatchewan
Email: yuh515@mail.usask.ca

We are interested in learning about your opinions and attitudes toward some new, novel, food items. Researchers at the University of Saskatchewan are conducting an online survey about how consumers perceive some new attributes in foods. We invite you to tell us your opinions.

This 15- to 20-minute survey, funded by AFBI; SSHRC; and Genome Canada, is hosted by Voxco, a Canadian-owned and managed company whose data is securely stored in Canada. This research project has been approved on ethical grounds by the University of Saskatchewan Research Ethics Board and has indicated that there are no foreseeable risks. Any questions regarding your rights as a participant may be addressed to that committee through the Research Ethics Office ethics.office@usask.ca; (306) 966-2975. Out of town participants may call toll free (888) 966-2975.

In order to complete this survey, you may be required to answer certain questions; however, you are never obligated to respond and you may withdraw from the survey at any time by closing your internet browser. Participation is strictly voluntary.

By selecting next and completing this questionnaire, your free and informed consent is implied and indicates that you understand the above conditions to participate in this study.

Please consider printing this page for your records.

Appendix F. Questionnaire for the Online Consumer Survey

Screener 1.

Before we begin… Who is the primary grocery shopper (the person responsible for at least 50% of food purchases) in your household?

□ I am.

□ Shared responsibility.

□ Someone else.

Background Information

The World Health Organization (WHO) defines genetically modified (GM) foods as foods derived from organisms whose genetic material has been modified in a way that does not occur naturally. Currently, most available GM foods are produced from plants.

□ I have read and understood this information.

Q1. If GM foods were available in food stores near me, I would…

Definitely avoid them 1	Somewhat avoid them 2	Neither avoid or seek them out 3	Seek them out somewhat 4	Definitely seek them out 5	Don't know
□	□	□	□	□	□

Q2. Under which situation(s) would you consider buying GM foods (select all that apply)?

□ If they provided more nutrients

□ If they used fewer artificial chemicals

□ If they were much less expensive

□ If they tasted better

□ If they were more environmentally friendly

□ If they provided more foods to meet the world's growing needs

□ If they were good for the local economy

□ If they were certified by the government

□ If they were recommended by friends or family

□ Other (please specify):_____

□ I would not consider buying GM foods in any situation

Q3. If a loaf of bread made from regular non-GM wheat sells for $3.00 at your local food store, how much would you pay for similar bread **made from GM wheat?**

□ $ 4.00 or more
□ $ 3.75
□ $ 3.50
□ $ 3.25
□ $ 3.00 (same price)
□ $ 2.75
□ $ 2.50
□ $ 2.25
□ $ 2.00 or less
□ Would not buy

Q4a. Please indicate whether you agree or disagree with each of the following statements…

	Strongly disagree 1	Disagree 2	Neither agree nor disagree 3	Agree 4	Strongly agree 5	Don't know
GM foods are already on the market in Canadian stores.	□	□	□	□	□	□
I am knowledgeable about GM technology.	□	□	□	□	□	□

Q4b. How much control do you think you have over whether you can purchase or avoid GM foods?

No control at all 1	A little control 2	Moderate control 3	A lot of control 4	Complete control 5	Don't know
□	□	□	□	□	□

Q4c. How confident do you think you are over whether you can purchase or avoid GM foods?

Not confident at all 1	A little confident 2	Moderately confident 3	Very confident 4	Completely confident 5	Don't know
□	□	□	□	□	□

Q5. Please indicate whether you agree or disagree with each of the following statements…

	Strongly disagree 1	Disagree 2	Neither agree nor disagree 3	Agree 4	Strongly agree 5	Don't know
I think that people important to me support my choice of GM foods.	□	□	□	□	□	□
I think that people who influenced my behavior want me to buy GM foods instead of any alternative products.	□	□	□	□	□	□
I think people whose opinions I value prefer that I choose GM foods for daily diets.	□	□	□	□	□	□

Q6 Header

Please indicate your opinions about GM technology for each of the following scales.

In general, I believe that the use of GM technology in food production is...

Q6a.

Very bad 1	Bad 2	Neither good nor bad 3	Good 4	Very good 5
□	□	□	□	□

Q6b.

Very dangerous 1	Dangerous 2	Neither safe nor dangerous 3	Safe 4	Very safe 5
□	□	□	□	□

Q6c.

Very foolish 1	Foolish 2	Neither wise nor foolish 3	Wise 4	Very Wise 5
□	□	□	□	□

Q7. Please indicate whether you agree or disagree with each of the following statements…

	Strongly disagree 1	Disagree 2	Neither agree nor disagree 3	Agree 4	Strongly agree 5	Don't know
GM foods can potentially provide enhanced nutrition.	□	□	□	□	□	□
GM foods may use fewer chemicals.	□	□	□	□	□	□
GM foods can result in better price because of the higher production.	□	□	□	□	□	□
In general, applying GM technology in food production will provide benefits to agriculture and food industries.	□	□	□	□	□	□
Overall, applying GM technology to produce foods with higher productivity will provide benefits on maintaining the global food supply.	□	□	□	□	□	□
Overall, applying GM technology to produce foods with less use of chemicals will provide benefits to the environment.	□	□	□	□	□	□
GM foods involve considerable health risks.	□	□	□	□	□	□
GM foods posit considerable risks to the environment.	□	□	□	□	□	□

GM foods raise considerable ethical risks or concerns.	□	□	□	□	□	□

Q8. If GM foods on the market actually contain the beneficial attributes they promised, I would...

Definitely avoid them 1	Somewhat avoid them 2	Neither avoid or seek them out 3	Seek them out somewhat 4	Definitely seek them out 5	Don't know
□	□	□	□	□	□

Q9. If a loaf of bread made from regular non-GM wheat sells for $3.00 at your local food store, how much would you pay for similar bread **made from GM wheat that contains enhanced nutrition?**

□ $ 4.00 or more
□ $ 3.75
□ $ 3.50
□ $ 3.25
□ $ 3.00 (same price)
□ $ 2.75
□ $ 2.50
□ $ 2.25
□ $ 2.00 or less
□ Would not buy

DESCRIPTION 1

You're almost done!

Q10. Please indicate whether you trust or distrust each of the following sources for providing credible information about GM foods...

	Completely distrust 1	Distrust 2	Neither trust nor distrust 3	Trust 4	Completely trust 5	Don't know
My self (own knowledge)	□	□	□	□	□	□
Registered Dietitians	□	□	□	□	□	□
Medical Doctors	□	□	□	□	□	□
Farmers	□	□	□	□	□	□

Friends and family	□	□	□	□	□	□
Government	□	□	□	□	□	□
Agricultural Businesses	□	□	□	□	□	□
Food Retailers	□	□	□	□	□	□
Standard Media	□	□	□	□	□	□
Social Media	□	□	□	□	□	□

Q11a.

Culture is an important part of our lives. One of the aspects of culture is the notion of individualism. In individualist societies, people emphasize on looking after themselves and their direct family. In collectivist societies, people emphasize on group benefits (such as teams at the workplace). While there is no right or wrong answer, people's cultures are just different. Please tell us a bit about your culture values by indicating whether you agree or disagree with each of the following statements:

	Strongly disagree 1	Disagree 2	Neither agree nor disagree 3	Agree 4	Strongly agree 5	Don't know
Individuals should sacrifice self-interests for the group.	□	□	□	□	□	□
Individuals should stick with the group even through difficulties.	□	□	□	□	□	□
Group welfare is more important than individual rewards.	□	□	□	□	□	□
Group success is more important than individual success.	□	□	□	□	□	□
Individuals should only pursue their goals after considering the welfare of the group.	□	□	□	□	□	□
Group loyalty should be encouraged even if individual goals suffer.	□	□	□	□	□	□

Q11b.

Uncertainty Avoidance is another important aspect of culture. Ambiguity brings anxiety. Different cultures have developed different ways to deal with this anxiety. One of the strategies is

to create rules and regulations to avoid uncertainties. Please tell us about your cultural values by indicating whether you agree or disagree with each of the following statements:

	Strongly disagree 1	Disagree 2	Neither agree nor disagree 3	Agree 4	Strongly agree 5	Don't know
It is important to have instructions spelled out in detail so that I always know what I'm expected to do.	□	□	□	□	□	□
It is important to closely follow instructions and procedures.	□	□	□	□	□	□
Rules and regulations are important because they inform me of what is expected of me.	□	□	□	□	□	□
Standardized work procedures are helpful	□	□	□	□	□	□
Instructions for operations are important.	□	□	□	□	□	□

DESCRIPTION 2

Next, please tell us a bit about yourself...

D1. Which gender do you prefer to identify with?

□ Male
□ Female
□ Other
□ Prefer not to say

D2. What is your age range?

□ 18-25
□ 26-35
□ 36-45
□ 46-55
□ 56-65
□ 66 or above

D3. What is the highest level of education you have achieved?

□ Elementary or junior high school
□ Some high school
□ Completed high school
□ Some post-secondary (i.e., college or University)
□ Completed college or technical institute
□ Completed Bachelor's degree
□ Completed Master's degree
□ Completed Ph.D. degree
□ Prefer not to say

D4. For comparison purpose only, which one of the following category best describes your annual household income before taxes?

□ Under $25,000
□ $25,000-$39,999
□ $40,000-$59,999
□ $60,000-$79,999
□ $100,000-$125,000
□ More than $125,000
□ Prefer not to say

D5. Other than Canadian, to which ethnic or cultural groups do you consider yourself to belong (select all that apply)?

□ Aboriginal (First Nations, Inuit, Métis)
□ African
□ Asian (including South Asian)
□ Middle Eastern
□ Caucasian (or European)
□ Latin-American
□ Other
□ Prefer not to say

D6. Do you have any other comments on GM foods?

Thank you very much!

Appendix G. End of Survey (the online survey) Messages

[Survey Completion]

Thank you for your participation in this survey. If you have any questions about the survey or would like to receive a summary of the research results, please contact Yufei Huang, STUDENT or Dr. David Di Zhang, PROFESSOR at the University of Saskatchewan.

[Ineligible]

We're sorry. You do not meet the qualifications for this survey. We sincerely thank you and appreciate your time, dedication, and continued participation in our online surveys.

[Quota Filled]

We're sorry. We've already met our quota of participants from your region. We sincerely thank you and appreciate your time, dedication, and continued participation in our online surveys.

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