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Modelling Reference-Dependent and Labelling Effects in Consumers' Functional Food Choices

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Abstract

This paper examines the reference-dependent and labelling effects when consumers make choices about functional foods, and explores how changes in reference points could alter individuals' preferences. Functional food (Omega 3 milk) and regular food (regular milk) are used as examples to explore the potential reference-dependent effects and labelling effects. A consumer utility model with reference point effects is developed. The paper also explores how to model the effects of different labelling (health claim) policies, which could influence consumer preferences by changing consumers' reference points.

1. Introduction

Even a casual perusal of food products on offer in a supermarket in Canada, the US, Europe or Japan would reveal a growing array of new food products which claim to provide health benefits, so-called functional foods. Usually the prices for these products are higher than for an equivalent conventional (regular) food. For example, fruit juice with calcium which is claimed to be good for the bones, breakfast cereals with soluble fibre, claimed to be good for the heart, and omega-3 milk which is believed to be good for heart health and perhaps may reduce the risks of cardiovascular diseases and cancer.

The functional food sector is one of the fastest-growing sectors in the food industry. The global market for functional foods was estimated to be worth about US\$33 billion in 2000 (Hilliam, 2000), and had grown to an estimated US\$85 billion by 2006 (Nutrition Business Journal, 2007). Functional dairy products, such as omega-3 milk, probiotic and prebiotic yogurts, are one of the earliest and most widely adopted forms of functional foods.

Relatively little socio-economic research has examined the functional food sector in Canada. When making food choices, an individual consumer might over-consume unhealthy foods or under-consume healthy foods. Understanding how consumers make choices with respect to functional foods is an important new research area¹.

In the standard models of decision making, the Expected Utility Theory (EUT) is a traditional one to model consumers' choice behaviors, in which the utility of a choice is represented by the sum of the possible outcomes weighted by their probabilities. Although EUT is a long lasting and well developed theory, there are some alternative theories in behavior economics giving some illustrative evidences that violate and make a fundamental bias on the principle of EUT, such as the so-called Prospect Theory (Kahneman & Tversky, 1979) whose creators won a Nobel Prize in economics. The Prospect Theory is originally about the analysis of decision making under uncertainty and represented by an asymmetric S-shaped value function, in which value is measured by gains or losses rather than final assets. Derived from the Prospect Theory, the same authors created another more developing consumer choice theory for riskless choice called a Reference-Dependent Model ((RDM, Tversky & Kahneman, 1991). The central assumption of RDM is that "losses and disadvantages have greater impacts on preferences than gains and advantages", which means people will work harder to avoid losses than to obtain gains. According to the psychological analysis of value, reference levels play a large role in preference determinacy. People are more sensitive to an outcome valued as a gain or a loss comparing with a reference level than the absolute final outcomes.

¹ See Zou and Hobbs (2006) for a more detailed overview of the functional food sector and a discussion of potential models for evaluating consumer preferences.

The Prospect Theory shows that people's preferences violate the principle of EUT when making decisions among risky prospects by several distinct effects, such as the certainty effect, the reflection effect and the isolation effect. The certainty effect shows a phenomenon that people tend to place more weight on outcomes that are viewed as certain rather than outcomes associated with probabilities. The reflection effect means that preference for the negative prospects (losses) is the mirror image of the positive prospects (gains) which means that the preference order changes around value zero. Combining the certainty effect and the reflection effect together shows that people are risk averse in choices involving sure gains and are risk seeking in choices involving sure losses. The isolation effect shows that when making choices, people tend to ignore the common components that the alternatives share, and focus on the components that distinguish them. In Prospect Theory, outcomes are expressed as changes (gains or losses) from a neutral reference point. There are two important properties of this theory: reference dependent and loss aversion. Reference dependence means that individuals' preferences depend on a reference point; and a change in a reference point often leads to reversals of preference. Loss aversion means losses dominate gains, and people will work harder to avoid losses than to obtain gains.

Functional foods are a credence good which means people can not infer the quality before or even after purchase and consumption. This might be the greatest inherent limitation for functional food products. How to define the general health benefits? (e.g. how could people tell calcium is good for bones?) Even if a consumer believes that the effect of functional food is to improve health benefits (gains), there are still some uncertain factors in the consumer's mind about how and whether functional food could work for his own body,

because without more information, the quality of functional food can not be effectively inferred.

Using an example of functional dairy products, this paper examines how reference-dependent and labelling effects could be used to model consumer preference changes in functional food choices. In particular, this approach recognizes that consumers make choices depending on their current health status, the credibility of health claims, and the extent to which they believe that the introduction of a functional ingredient will lead to an improvement in their health status.

2. Examples of Reference-Dependent Effects: Preference Change

Let's take regular yogurt and probiotic yogurt as an example to show how an individual's preferences might change when his reference point changes. As shown in figure 1, one consumer bundle of goods is represented by $X = \{x, y, r, s\}$, with x & y denoting options, and r & s denoting reference points. Each option $X=(x)$ represents one unit of regular yogurt with two product attributes: health benefit and price. Bundle $Y=(y)$ represents one unit of probiotic yogurt (functional food), also with the same two attributes but at different levels.

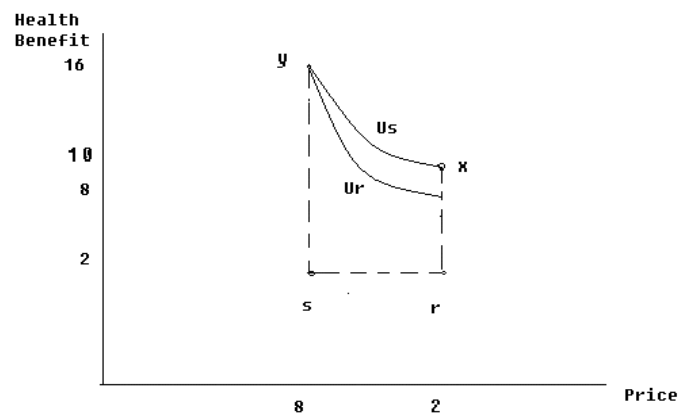


Figure 1: Reference Points change for one person

This figure shows us how changes in an individual's reference point could change that consumer's preferences. Suppose a consumer visits a store and notices one type of yogurt with 2 'units' of health benefits selling at \$8 (point s). The consumer takes this information as his reference point, and this individual would be indifferent between spending \$8 to receive a probiotic yogurt (y) with 16 units of health benefits or spending \$2 to receive a regular yogurt (x) with 10 units of health benefits. So his indifference curve is U_s in figure 1.

Suppose on another day, the same consumer visits another store and discovers that there is another type of yogurt also with 2 units of health benefits, but that this yogurt is priced at \$2 (point r). The consumer's reference point has changed from s to r, and in this new information environment he will be indifferent between spending \$8 to get the probiotic yogurt with 16 units of health benefits or spending \$2 and receiving 8 units of health benefits. So the consumer's indifference curve shifts to U_r , which lies beneath his original indifference curve U_s . Now, the consumer prefers the regular yogurt (x) over the probiotic yogurt (y).

Developing the case further in figure 2, we can show how the preferences of two consumers change to different levels when their reference points change. We assume that two consumers initially have the same indifference curve U_s and assume that point s (\$8, 2units) is their reference point. If conditions change in the market such that another reference point r (\$2, 2 units) is available, they change their reference point from s to r.

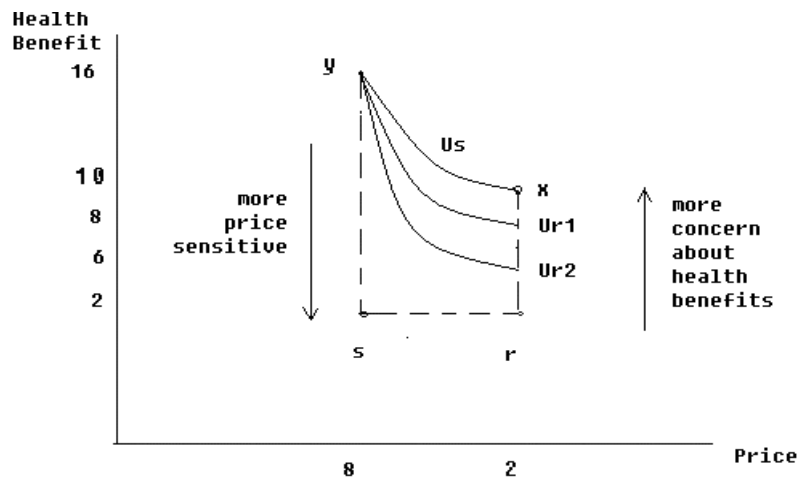


Figure 2: Reference Points Change for two person

Consumer 1's new indifference curve shifts to U_{r1} , which means that the probiotic yogurt (\$8, 16 units) delivers the same utility as the regular yogurt (\$2, 8 units). However, consumer 2's new indifference curve shifts to U_{r2} , implying that the probiotic yogurt (\$8, 16 units) delivers the same utility as a different regular yogurt (\$2, 6 units). Thus, the two consumers react differently. From figure 2 we can see that U_{r2} lies beneath U_{r1} , indicating that consumer 1 is more concerned about health benefits than consumer 2, or alternatively, consumer 2 is more price sensitive than consumer 1.

Building on Tversky and Kahneman (1991), this paper explores an extension to the reference dependent model. First, it should be noted that there are two kinds of reference point effects: one is well known, that individuals with different reference points will have different preferences; the other more interesting possibility is that an individual's preferences could change if his reference point changes. Here we explore that possibility as an approach to modelling the effects of different information environments on consumer preferences for functional food.

3. Modelling Consumer Utility with Reference-dependent Effects

To capture the reference dependent effects from the reference-dependent model, first it is necessary to specify the utility function of individual consumers with heterogeneous choices, as in figure 3.

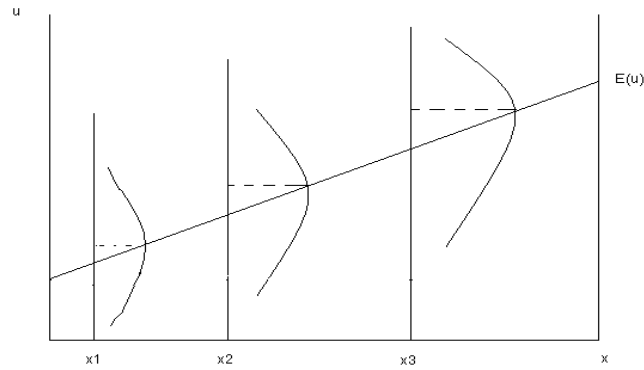


Figure 3: A Utility Model with Heterogeneous Consumers' Choices

Based on ordinary random utility theory, here, $E(u)$ captures the average expected utilities for all consumers; while x_1 and x_2 , etc. represent individual consumers. Consumers will have different expected utilities from a given product. For an individual consumer i , his utility function could be expressed as:

$$u_i = E(u_i) + \varepsilon_i \quad \varepsilon \rightarrow N(0, \delta^2)$$

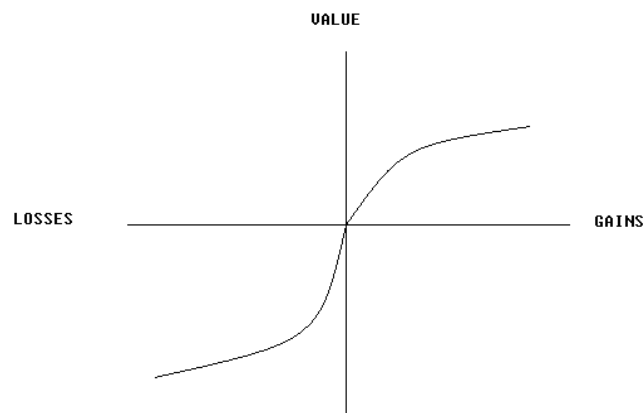


Figure 4: An Illustration of a Value Function
Source: Tversky and Kahneman, QJE, 1991

In Prospect Theory or Reference Dependent Model (Tversky and Kahneman, 1979 & 1991), the outcomes are represented by gain or loss comparing with a neutral reference value. As shown in figure 4, the reference value function is an asymmetrically S-shaped function, which is concave above the reference point and convex below it. The reference value function R_i is expressed as following,

$$R_i(x_i) = \begin{cases} u_i(x_i) - u_i(r_i) & \text{if } x_i \geq r_i \\ \lambda * [u_i(x_i) - u_i(r_i)] & \text{if } x_i < r_i \end{cases}$$

Where $R_i(\cdot)$ is the reference value function and $u_i(\cdot)$ is the utility function which are all associated with the reference state r_i . The first line of the expression captures the reference gain effect and the second line captures the reference loss effect. λ is a parameter which can be described as a coefficient of loss aversion with a restriction that λ is greater than 1. This is according to the central assumption of Reference Dependent Model, which is that losses and disadvantages have greater impacts on preferences than gains and advantages.

Let's take a look at the reference point effects for the price attribute first. Assume all the variables are constant in the utility function except the price attribute. Now the utility function changes to:

$$u_i = u_0 - p_i - \lambda p_{loss_i} + p_{gain_i} + \varepsilon_i \quad \varepsilon \rightarrow N(0, \delta^2)$$

Where p_{loss_i} captures the difference between the reference price and the observed price when the observed price is above the reference point; p_{gain_i} captures the difference between the reference price and the observed price when the observed price is below the reference point; p_i is the observed price for an individual i ; u_0 captures the basic utility from consuming the product. With a restriction that $\lambda > 1$, this restriction captures the asymmetric

response above and below the reference point, which means the decision maker exhibits loss aversion. For empirical applications, the test of the presence of loss aversion is that the estimated value of λ is significantly greater than one (Bell and Lattin, 2000).

Take the health Effect (HE) attribute as an example to show the reference dependent effects. Also assume all the variables are constant in the utility function except the HE attribute, thus the utility function could be expressed as:

$$u_{FF} = u_0 - P_{FF} + HE_{FF} + HE_{gain_i} - \lambda * HE_{loss_i} + \varepsilon_i$$

$$u_{RF} = u_0 - P_{RF} + HE_{RF} + \varepsilon_j \quad \varepsilon \rightarrow N(0, \delta^2)$$

Where u_{FF} and u_{RF} are the per unit utilities from consuming one unit of the functional food (FF) and one unit of the traditional food (RF); the corresponding prices are P_{FF} and P_{RF} . The parameter u_0 is a per unit base level of utility to consume one unit of yogurt. HE_{FF} and HE_{RF} are the health effect attributes for the functional food and the regular food. Taking HE_{RF} as the reference point and HE_{FF} as the observed attribute, HE_{gain_i} captures the difference between the reference point and the observed attribute when the observed attribute is more than the reference point, which means $HE_{FF} - HE_{RF} > 0$; HE_{loss_i} captures the difference between the reference point and the observed attribute when the observed attribute is less than the reference point, which means $HE_{FF} - HE_{RF} < 0$. Also with $\lambda > 1$, the utility function is consistent with the evidence for loss aversion.

Now we can introduce the consumer utility model with reference-dependent effects. A potential framework within which to apply reference-dependent effects in consumer utility theory is a model allowing for product differentiation. In what follows, we draw upon Fulton & Giannakas (2004) who used a utility model to explore the effects on consumer utility of

labelling genetically modified foods.

3.1 Consumer's problem

Taking a group of consumers, each one makes a choice to consume one unit of a traditional product (regular yogurt, RF) or a functional food product (Probiotic yogurt, FF). The consumers are differentiated with respect to a characteristic c , which represents consumers' willing-to-pay (WTP) determined by heterogeneous consumers' choice decisions based on the 'health effect' attribute. The consumer with characteristic c ($c \in [0,1]$) has a utility function defined by:

$$u_{FF} = u_0 - P_{FF} + HE_{FF} + (HE_{FF} - HE_{RF}) * C - \lambda * (HE_{FF} - HE_{RF}) * C$$

$$u_{RF} = u_0 - P_{RF} + HE_{RF}$$

The first equation, u_{FF} , measures the utility if one unit of functional food has been consumed. The second equation, u_{RF} , measures the utility if one unit of regular food has been consumed.

The notation explanations (e.g. u_0 , P_{FF} , P_{RF} , HE_{RF} and HE_{FF}) are the same as above except for the last two items in the first equation. Taking HE_{RF} as the reference point and HE_{FF} as the observed attribute, the item $(HE_{FF} - HE_{RF}) * C$ represents the reference-dependent effects for the health effect gain; and the item $\lambda * (HE_{FF} - HE_{RF}) * C$ represents the reference-dependent effects for the health effect loss. Note that these two items can not co-exist for any individual consumer's utility function, because the consumer's will perceive either a health effect gain or loss from consuming functional food.

Using figure 5, we illustrate the consumer's problem graphically. The consumers with different reference points allocated from point 's' to point 'r' in figure 2 correspond to consumers with different characteristics (c) allocated from point 0 (s) to point 1(r) in figure 5.

Assume individual consumers are equally allocated on the horizontal axis.

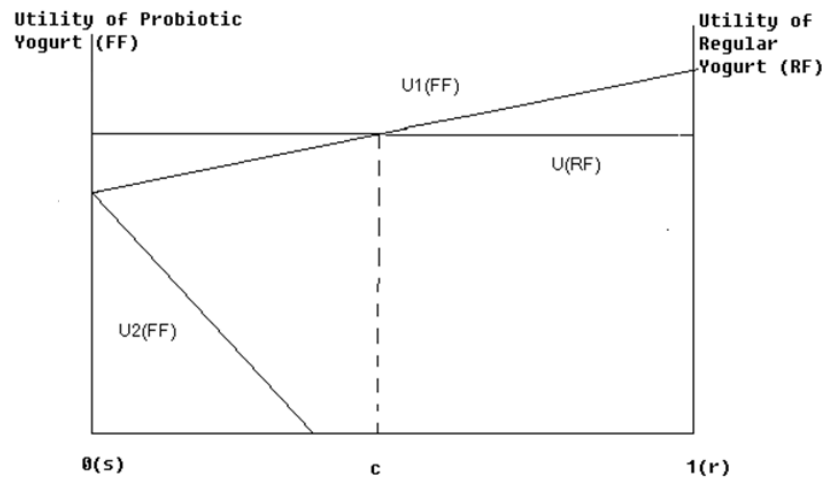


Figure 5: Utility Models with Reference-Dependent Effects

In this figure, 0(s) represents that consumer allocated at value 0 who takes point s as his reference point. 1(r) represents a consumer allocated at value 1 who takes 'r' as his own reference point. The horizontal line U (RF) is the utility curve for regular food. U1 (FF) represents the utility function for functional food when there is a gain for some consumers from functional food, which means $HE_{FF} - HE_{RF} > 0$. U2 (FF) represents the situation when there is a loss to all the consumers from consuming the functional food, which means that $HE_{FF} - HE_{RF} < 0^2$.

At the intersection between U (RF) and U1 (FF), the consumer situated at point c will be indifferent between regular yogurt and probiotic yogurt. The consumers located to the right of consumer c prefer probiotic yogurt since their utility from consuming probiotic yogurt is higher than regular yogurt; and the consumers to the left of consumer c prefer regular yogurt.

3.2 Consumer Demand Curves

1) When there is a health effect gain to consuming functional food products, item

² This is an extreme case. Hypothetically it could arise if there is a lack of clinical support for purported health claims, and if consumers have concerns about potential negative long-run side-effects for health, or there are

$\lambda * (HE_{FF} - HE_{RF}) * C = 0$ in the above utility curve. Now the utility curve will be:

$$U1(FF) : u_{FF} = u_0 - P_{FF} + HE_{FF} + (HE_{FF} - HE_{RF}) * C$$

$$U(RF) : u_{RF} = u_0 - P_{RF} + HE_{RF}$$

The consumer with characteristic c ($c : U1_{FF} = U_{RF} \Rightarrow c = \frac{P_{FF} - P_{RF}}{HE_{FF} - HE_{RF}} - 1$) is

indifferent between consuming the functional food and the regular food. The demand curve for the functional product is given by $x_{FF}^D = c$,

$$x_{FF}^D = 1 - \frac{P_{FF} - P_{RF}}{HE_{FF} - HE_{RF}}$$

And the demand for the regular food is given by.

$$x_{RF}^D = \frac{P_{FF} - P_{RF}}{HE_{FF} - HE_{RF}}$$

2) When consumer believes that there is a health effect loss to consuming functional food products, $(HE_{FF} - HE_{RF}) * C = 0$ in the utility curve. Now the utility curve will be:

$$U2(FF) : u_{FF} = u_0 - P_{FF} + HE_{FF} - \lambda * (HE_{FF} - HE_{RF}) * C$$

$$U(RF) : u_{RF} = u_0 - P_{RF} + HE_{RF}$$

If this is the case, we can see from the figure 5 that the utility curve for regular food lies completely above the utility curve for the functional food product. So the demand curve for the functional product is given by:

$$x_{FF}^D = 0$$

And the demand for the regular food is given by.

$$x_{RF}^D = 1$$

Note that situation 2) is simply an extreme case of situation 1) (zero consumption of functional foods). This result is consistent with economic intuition since usually the price of a functional food is higher than its conventional equivalent. If consumers believe that there

problems with allergies or drug interactions (Brophy and Schardt, 1999).

are no health benefits from consuming functional food, no-one will consume functional food given its price premium, and all consumers will choose regular food. In this model, consumers' attitudes about health effects and prices determine the market shares of functional food and regular food. Only when consumers believe that there are health effect gains from consuming functional food will the market be shared between functional food and regular food. In the absence of perceived health benefits, the utility functions above indicate that there will be no market for functional food, which of course is consistent with our intuition.

3.3 Econometric Model for Reference Dependent Effects

$$u_{ij} = \beta_0 + \beta_1 FI_j + \beta_2 P_j + \beta_3 FI_{gain_j} + \beta_4 FI_{loss_j} + \beta_5 P_{gain_j} + \beta_6 P_{loss_j} + e_j$$

This is a simple example of a random utility function with reference dependent effects for functional ingredient and price attributes. The utility of consumer i to purchase milk product j is represented by u_{ij} . FI is the functional ingredient variable which is a proxy variable of the health effect variable (HE) in the previous theory utility equations and P is price. In the empirical work, one way to capture those reference dependent effects is by the Stated Preference Method.

For the price variable, researchers could ask the respondent question on how much he normally pays for regular milk, and take the perceived price as the reference price (Pr). Take the price he chooses in the choice experiment of the survey as the alternative price (Pa). Comparing Pr with Pa , if $Pa < Pr$, $P_{gain_j} = 1$, otherwise 0; if $Pa > Pr$, $P_{loss_j} = 1$, otherwise 0; Those P_{gain} and P_{loss} dummy variables interacted with the price variable could also be included in the above utility function to capture

the interaction effects.

For the functional ingredient variable, researchers could ask whether consumer believes that certain functional ingredient is normally contained in his regular consumed milk product. If yes, $F_{Ir} = 1$, otherwise $F_{Ir} = 0$. Use $F_{Ia} = 1$ to represent that the respondent choose a functional milk in the choice experiment, otherwise $F_{Ia} = 0$. The $F_{Igain} = 1$ and $F_{Iloss} = 0$ if $F_{Ia} - F_{Ir} = 1$; and the $F_{Iloss} = 1$ and $F_{Igain} = 0$ if $F_{Ir} - F_{Ia} = 1$, otherwise 0. A Mixed Logit Model could be used to estimate this random utility function.

How do consumers perceive whether there are health effect gains or losses from choosing functional food rather than regular food? Labelling information plays a key role in allowing consumers to make informed choices.

4. Modelling Labelling Effects and Health Claims Policy

Another interesting research question is about how consumers obtain information on the health effects of functional food. It connects to an important regulatory policy issue which is the health claims on food labels. Currently, Health Canada only allows five kinds of science-based risk reduction health claims compared with seventeen kinds of risk reduction health claims allowed by FDA in the United States. The functional food market in the United States was estimated about \$37 billion in 2001. Canadian consumers may be limited and prevented from consuming more functional foods, because of the currently more restrictive labelling policy compared with other countries. Currently in the Canadian market, some manufacturers use a logo or a visual cue on the products to inform the health effect information to consumers, e.g. the red heart on Omega-3 milk to imply that the product

provides heart health benefits. We call this kind of logo ‘partial labelling’ compared with the health claims which are considered as ‘full labelling’. Because of its attractive design or easy understanding of the logo, it is possible that partial labelling could convey the same amount of information and have the same function as full labeling. It is also possible that full labelling could increase consumer demand for functional food because of its direct health effect claims. So let’s leave this as an empirical research question to be tested.

With the growing scientific understanding and supporting the functions of functional ingredients in enhancing health, reducing the risk of diseases and preventing some chronic diseases, there might be some possibilities for the current food labeling regulations system to revise or make some changes on the health claims of functional food products. We know that the key characteristic to distinguish functional food from regular food is the health effect which could be viewed as improving health benefits, reducing risk of certain diseases or disease prevention. In the empirical part, the above three kinds of health claims will be tested by a Stated Preference Method with a choice experiment survey among Canadian consumers.

4.1 A Comparison of Health Claims Regulation in the U.S. and Canada

In making a decision regarding the consumption of functional food, consumers face two types of uncertainty: uncertainty about the health attributes of a specific food and uncertainty over future health outcomes. Given the information asymmetry inherent in functional foods, labelling information plays a key role in allowing consumers to make informed choices. Canadian current regulations for health claims on functional foods are relatively restrictive relative to a number of other countries where functional foods are a rapidly growing segment

of the food market.

The United States permits two types of claims: first, a health claim which links a nutrient to a particular disease, for example, “diets rich in calcium may reduce the risk of osteoporosis”, this type of health claim must be pre-approved by the U.S. Food and Drug Administration (FDA). Second, a product may carry a function claim linking a substance to an effect on the functioning of the body, for example, “calcium builds strong bones”. This type of health claims does not need pre-approval (Heller et al, 1999). Currently through the FDA’s health claims regulation system, 17 kinds of health claims are allowed for functional foods products in the United States.

Under the current food labelling policy in Canada, Health Canada (2003) only allows five specific science-based risk reduction claims to be used on food labels or in advertisements. The allowed health claims in Canada are the following (Health Canada, 2003):

1. a healthy diet low in sodium and high in potassium and reduced risk of high blood pressure;
2. a healthy diet with adequate calcium and vitamin D and reduced risk of osteoporosis;
3. a healthy diet low in saturated and trans fat and reduced risk of heart disease;
4. a healthy diet rich in vegetables and fruit and reduced risk of some types of cancers;
5. the non-cariogenic benefits of non-fermentable carbohydrates in gums and hard candies

These are risk reduction claims. Disease prevention claims, linking consumption of a food to the prevention of a specific disease, are not permitted on food products in Canada. Products claiming to treat, cure, mitigate or prevent a disease or illness are regulated as drugs. The above five health claims are based on ten existing approved health claims by the United

States under the Nutrition Labeling and Education Act (NLEA) in the 1990s. Health Canada (2003) reviewed those ten claims and determined that five of them would be allowed in Canada, while the other five claims remain unapproved. The unapproved health claims include: “fat and cancer; folate and neural tube defects; fiber-containing grain products, fruits, and vegetables and cancer; fruits, vegetables, and grain products that contain fiber, particularly soluble fiber, and risk of coronary artery disease; soluble fiber and risk of coronary artery disease”. (Fitzpatrick, 2004)

In the absence of labelling, the health effect of functional food is a credence attribute, since the differences between a functional and a regular food cannot be detected by search or experience. The relatively restrictive labelling regulatory environment in Canada has resulted in food companies using other means to signal potential health benefits. We refer to this as partial labelling. For example, food firms use a logo or visual cue to imply a health benefit. Figure 6 provides an example - the use of a red heart mark on the product package - which is clearly meant to imply that consumption of the product is good for heart health. In other cases, food products contain an endorsement or healthy diet recommendation by a third party, such as the Canadian Diabetic Association, or the ‘Health Check program of the Heart and Stroke Foundation. In some cases, products contain indirect health claims that imply health benefits (e.g. Claims “low in saturated and trans fat”) that require consumers’ knowledge of the relationship between consumption and heart disease. In contrast, full labelling would allow direct and specified health claims on product labels (e.g. "Calcium reduces the risk of osteoporosis.").



Figure 6: Partial labelling example

Due to the relatively more restrictive labelling regulatory environment in Canada, many Canadian functional food products cannot be sold domestically as functional foods and tend to be exported to the United States, which has a growing functional food market estimated to be worth about \$37 billion in 2001. (Boyd, 2001) This also means that Canadian consumers are prevented from purchasing functional food products that might otherwise have been marketed in Canada. Clearly, the regulatory system needs to balance consumer protection, and the avoidance of spurious or misleading health claims, with the ability for food manufacturers to communicate the health benefits of genuinely beneficial functional foods to consumers. While this is a difficult balance, the fact remains that far fewer health claims are allowed in Canada relative to other countries, and the range of functional food products on the market is therefore more limited.

4.2 Econometric Model for Labelling Effects and Choice Experiment

$$u_{ij} = \beta_0 + \beta_1GHC_j + \beta_2RRHC_j + \beta_3DPHC_j + \beta_4PartialL_j + \beta_5FI_j + \beta_6P_j + \beta_7FIgain_j + \beta_8FIloss_j + \beta_9Pgain_j + \beta_{10}Ploss_j + e_j$$

This random utility function is developed from the previous utility function in section three, which has been added in the labelling effects variables. Where the GHC variable represents the functional or structure health claims, the RRHC is the risk reduction health

claims variable and the DPHC is the disease prevention health claims variable. By conducting a choice experiment in the survey, the data could be collected for the above estimation equation.

One usual way for consumers to obtain information of health effects of functional food is by health claims on product's labels. According to Reference-Dependent Model, people might reverse their preferences on different health claims by considering the health effect as a gain or to avoid a loss, e.g. a consumer may prefer an omega 3 milk product if it is claimed as reducing the risk of cardiovascular diseases (health loss avoidance) rather than claimed as general heart health maintenance. A change in the labelling information through different types of health claims might change consumers' reference points for the health effect attribute, thereby altering their preferences for functional food. Given the importance of labelling and information asymmetry in understanding the consumer decision-making process for functional foods, the effect of different labelling strategies will be examined in the future empirical work; in particular, whether different labelling policies could offer sufficient information to change consumers' reference points and thus reduce consumer heterogeneity.

5. Conclusion and Future Research

This paper incorporated reference-dependent theory from the psychology literature into a model of consumers' decision making for functional dairy products. It focused on the reference-dependent effects when consumers make choices, showing how changes in reference points could change individuals' preferences, and whether labelling could offer sufficient information to change consumers' preferences. The effect of different labelling policies on the health claims attribute is of interest, particularly when we compare a partial

labelling scenario with that of full labelling.

This paper provides a basis for future empirical analysis of the demand for functional food under different labelling situations. In particular, empirical analysis could assess whether there are reference-dependent and labelling effects for both health effects and health claims attributes for Canadian consumers of functional food; how consumers react to full labelling versus partial labelling, and the extent to which this may reduce consumer heterogeneity.

There are three major variables in the model: Health Effects, Health Claims Labelling and Price. A related area for future study is to determine what factors could change consumers' reference points for the Health Effects and Health Claims variables. An initial assessment suggests that there are at least three possible factors that could change consumers' reference points: consumer's current and anticipated future health status, the credibility of labelling claims, and how much effort consumers put into reading labels. Further research could examine these factors, as well as determine how they could be influenced by public information campaigns, or by an industry association through generic advertising targeting the health benefits of, for example, functional dairy products.

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