

White paper:

Using Stated Choice Models to Forecast Market Acceptance of New Product Introductions: A Canadian Quick Service Restaurant Illustration

February 12, 2002

© 2002 Tim Glowa

Tim@Glowa.ca

Table of contents

Abstract.....	3
Introduction and Literature Review	4
Multinomial Logit Model (MNL).....	4
The importance of brand equity	5
Defining the problem	6
Methodology.....	8
Limitations	9
Modeling decisions – Maximum Likelihood Estimation.....	11
Results.....	12
Predictive validity of the multinomial logit model	13
Importance of brand as a factor influencing behaviour	14
Discussion of the results	16
Establishment of a base case scenario	16
Salad bar introduced by Burger King:	17
Salad bar introduced by McDonald’s:	18
Salad bar introduced by Burger King and McDonald’s:	18
Conclusion	19
Works Cited:.....	20
Appendix 1	23
Appendix 2 – Model Results (Two Way Effects).....	24

Abstract

This paper examines how *stated choice discrete choice modeling* can be used to examine the market response of a new product introduction. This technique forecasts market acceptance given product or service changes. The results of this model conclude that among the targeted respondents (university aged students across Canada), there is little demand for a low fat burger. Further, the acceptance of new product introductions (in this case, deemed a \$2 salad bar) depends on the relative brand strength of the offering company. This paper determines that a new product introduction by the brand equity leader will be accepted more favorably than a similar introduction by the market share leader.

Introduction and Literature Review

The choices consumers make among competing products in product classes has received considerable research attention in marketing, particularly since 1975. Much of the recent widespread developments, in the area of forecasting consumer behaviour, are the result of increasingly sophisticated tools for the analysis of consumer choices, exemplified by the widespread application of conjoint and discrete choice models in marketing research (Bastell 1980, Bastell and Lodish 1981, Currim 1981, 1982, Louviere and Hensher 1983, Mahajan, Green, and Goldberg 1982).

However, less research has been conducted using choice models to examine consumer behaviour for quick service restaurants (Louviere 1984), and virtually no published research has examined this market specifically from the Canadian perspective.

The approach of this study is based on developments in the design of choice experiments that can be analyzed using discrete, dependent, variable models such as the multinomial logit (MNL) model (McFadden 1981), the Nobel Prize winning science.

Multinomial Logit Model (MNL)

Following the comparison, evaluation, and impression formulation stage in the consumers' pre-purchase mindset, consumers form final choice sets, and determine which brand, if any to choose. Typically, this involves deciding which brand is better, taking into account all available information. Consumers then decide whether to purchase any of the brands, and if so, which one (Louviere 1988).

We will confine our attention to the Multinomial Logit (MNL) choice model, which has been shown to approximate a variety of choice processes which individuals are likely to use in real situations (see Batsell 1980; Louviere 1983, Louviere and Hensher 1982). The MNL model is derived from random utility theory in the fields of economics and psychology (McFadden 1974), although its roots can be linked to Thurstone's Law of Comparative Judgment (1927).

A theory of discrete choice revolves around the concept that aggregate choice behaviour is defined by a set of individual behaviour rules, and an indirect utility function that contains, by necessity, a random element. This random component does not suggest that consumer choices are necessarily made randomly, rather, it implies the existence of important, but unobservable influences, that may affect behaviour. Therefore, it is crucial to include a random component in the model. In a sense, this random component is similar to the error term in normal ordinary least squares regressions (Glowa 2001b).

Random utility models examine choices among two or more alternatives. The model assumes that each individual has an unknown or true utility value that consists of a mean value that can be inferred from a series of choice observations, and random error, and can be thought of as (Louviere 1984):

$$U_i = V_i + e_i \quad -1-$$

where U_i is the unknown utility of interest for choice alternative i
 V_i is the systematic, observable, representative utility component for choice alternative i
 e_i is the random error component associated with choice alternative i

Equation 1 is the foundation of the MNL model and assumes that respondents are utility maximizers, in that they select alternatives that yield the highest overall utility. Louviere et al (2000) state:

... we assume that individuals will try to choose an alternative that yields them the highest utility. Hence, the empirical structure of the utility function is critical to modeling individual choices choice, and represents the process by which the attributes of alternatives and individuals' socioeconomic environments combine to influence choice probabilities, and in turn, the predictive capability of the choice model.

Therefore, the probability expression of interest is that of the maximum utility, found in some set of alternatives:

$$P(i | A) = P [V(i) + e(i) > V(a) + e(a) > \dots > V(N) + e(N)] \text{ for all } j \text{ in } A \quad -2-$$

Equation 2 states that the probability of choosing alternative i in some choice set A , of which i is a member, is equal to the probability that the mean value of i plus its random error is larger than the mean values and associated errors of all of the other j alternatives in set A .

The importance of brand equity

Managing brand name assets is a major concern for firms seeking to survive and prosper in the battle for consumer loyalty and market share. Like other assets, brand equity can be leveraged by extending the brand into new areas or products (ie: introducing new products under the same brand name). By modeling consumers purchase decisions for brand extensions, this paper will be able to determine if firms with greater brand equity can achieve market share increases through product extensions.

As Collins-Dodd et al (1999) point out, despite the long history and importance of branding, the theory of branding is very limited. Branding literature has focused primarily on establishing the functions of brand names as a guarantor of quality (Wernerfelt 1988); a positioning signal (Sappington and Wernerfelt, 1985); and a risk reduction mechanism (Montgomery and Wernerfelt, 1992). Boisvert and Coderre (2000) suggest that brand equity is the perceptual, attitudinal, and behavioural assets associated with a brand that give a competitive advantage to the product bearing the brand name, thereby increasing the product's value to consumers.

Several studies have examined the relationship between branding and consumer demand. Smith and Park's (1992) analysis of the introduction of new and extended brand consumer package goods found that extended brand names explained only a minimal variation in market share compared to new brand names. Collins-Dodd et al (1999) discovered that, among independent grocers, brand names significantly influenced the probability of listing a products brand extensions. Swait et al (1993) demonstrates that it is possible to quantify the relative advantage (or disadvantage) possessed by brands, in terms of wholesale prices, trade and consumer support, can be accomplished by establishing the value of a brand name using only price differences (deemed the equalization price).

Defining the problem

The problem of consumer choice of retail outlet is of tremendous importance to managers of retail operations for both the strategic and tactical guidance regarding location, architectural, product line, and other marketing mix variables as they apply to consumer patronage. To date, there have been relatively few studies in marketing that have examined the demand for quick service restaurant product extensions, particularly in Canada. Louviere (1984) examined the marketing implications of new product trials for fast food restaurants among consumers from a single midwestern city across three competitors.

This study presents an approach to predicting the likely number of patrons in the market, who will be motivated to try a new product introduced by a quick service restaurant. This approach allows the retailer to assess the changes in trial that are likely to occur in competition, with other product offerings from competing firms. Louviere (1984) states:

It is not enough to predict likely trial numbers for a single retailer in isolation from the activities of other competitors, assuming unchanging competition. Competitors often bring out new products and/or promotions of their own in response to the introduction of a new product of another firm. Thus, there is a need to assess the likely changes in trial numbers for new products and to determine where these numbers come from – that is, who are the customers who will try the new product?

The purpose of this article is primarily to examine the potential demand for a new product among competitive quick service restaurants in Canada. A secondary objective is to identify and determine the relative importance of brand equity in a consumer's choice of quick service restaurant.

Canadians are increasingly making efforts to improve their eating habits. According to a 1994 survey conducted by the Government of Canada (Health Canada 1997), 68% of all Canadian's over the age of 12 say they are concerned about the amount of fat in their

diet, and 86% of concerned 20 – 24 year olds report taking action to reduce the fat in the foods they eat.

There are three specific new products that will be examined in this paper. All relate to some form of healthier food, and may individually be present in the marketplace already. The first is a low fat burger (provided without any further quantification as to specific fat levels). The second is the provision of vegetarian burgers, both those tasting like real meat, and the more traditional non-meat-tasting vegetarian burger. The final new product offering is the provision of a salad bar, either included in the price of the burger, or provided for an additional charge.

The existence of these new product features is not in and of itself, unique. Harvey's has had a reduced fat burger (called the Veggieburger). In the UK, Burger King also offers a vegetarian burger. Further, Wendy's previously offered a "for charge" salad bar.

However the wider desire among consumers to evaluate and change their eating habits, to improve their overall health, and may have changed in recent times. While it could be argued that consumers do not expect to eat healthy foods from quick service restaurants, this study examines the market potential for offering such products.

In addition to examining the demand for new products, this paper also examines the influence of brand equity on an individual's choice of quick service restaurant. Many studies have been conducted using multinomial logit to measure the effect of brand on consumer behaviour across a wide range of applications [for instance, Riddington and Sinclair (2000) examine the demand for consumer switching behaviour at Scottish ski hills; Palmquist et al (1999) investigate how air quality is valued; Bolduc et al (1996), determine the key characteristics in choosing a medical practitioner], however no study has examined the importance of brand in the choice of quick service restaurant from the Canadian perspective.

In summary, this paper proposes the following hypotheses:

- H₁: The decision to introduce healthier new product offerings will be positively accepted among individuals.
- H₂: A strong brand can leverage itself into either new businesses or through product extension in existing businesses. The success of brand extensions will vary depending on whether the firm is the market share leader or the brand equity leader. Therefore, this paper will compare the launching of a new product between the market share leader and the brand equity leader. Because of the inherent and intangible strength of brand equity, this paper proposes that it will be easier for the market equity leader to extend its product offering than the market share leader.
- H₃: The optimal positioning strategy for both the market leader and equity leader will differ. This paper will explore the optimal strategies for these two firms.

Methodology

An online web based survey was administered to young adults living in Vancouver, Calgary, Edmonton, Toronto, and London, Canada. From a total of 250 invitations to participate in the survey, a sum of 133 valid surveys were completed, representing an effective response rate of 53%. The survey was administered over a two-week period in October 2001. Follow up e-reminders were sent to all non-respondents, and effectively increased cooperation rates.

It should be noted that this survey was intentionally administered to only one small segment of the aggregate quick service universe of potential and existing customers. These results, administered to the so-called “generation Y” segment, should not be considered representative of the entire universe of customers. Generation Y is characterized as the largest group of young North American’s since their parent baby boomers, and have generally grown up in an era of peace and economic prosperity. This group is known for its rampant consumerism (Matthews 2001).

Respondents were asked a series of questions relating to their past quick service restaurant experiences, preferences and satisfaction. Further, they were placed in controlled hypothetical choice situations (described as a lunch selection game) and asked to make decisions about where to go for lunch. This distinction is important because it constrains the model based on a particular usage situation (namely lunch selection). The results, therefore, should not be considered transferable to other meal alternatives (for example: snacks, breakfast, or evening dinner).

The explanation behind stated preference discrete choice models is rooted in economic utility theory. In this sense, “utility” is synonymous with satisfaction. Discrete choice models assume that an individual gains satisfaction from selecting a given resource. This satisfaction goes undefined in the model, but could include such factors as price paid and quality of the burger. Satisfaction is assumed to be a function of the attributes in the model, such as price, type of burger, service, availability of salad bar and type of meat. When presented with a set of competing product offerings, we assume that an individual will choose the product that maximizes this satisfaction. This satisfaction-maximizing assumption provides the theoretical frameworks for the competitive selection process in discrete choice models (Cooper and Millspaugh, 1999 and Glowa 2001a).

Limitations

As with most academic studies, there are typically limitations in the applicability of the findings. This study is no different. The recognized limitations identified in this paper include:

- Sampling limited to youth aged 17-25 across five major centres in Canada (Vancouver, Calgary, Edmonton, Toronto, and London, Ontario). The results cannot, therefore, be considered representative of the entire country, since several regions were omitted, as were any urban / rural differences. Further, younger individuals typically demonstrate higher price sensitivity than older age groups; youth naturally have lower incomes than many adults, although they often also have lower fixed expenses, and therefore relatively flexible disposable income.
- This paper ignores the importance of sub-branded products (like McDonald’s Big Mac, Burger King’s Whopper, or Wendy’s Big Classic sandwiches). Instead, individuals were faced with the generic choice of a “burger”.
- Further, it also ignores the presence of combination items (fries, onion rings or drinks).
- The competitors were limited to include major burger chains only (and therefore, exclude sandwich, taco, fried chicken or other quick service operators).
- As identified above, respondents were placed in a specific usage situation (namely selecting among competing quick service restaurants for lunch), and therefore the results cannot be extrapolated to other meals (for example evening dinner).
- Finally, the experiment was set up to model the effects of single product additions. This indicates that newer products (for example vegetarian burgers rather than real meat burgers) may replace existing products. Although in real life, a quick service restaurant may offer a variety of products (for example, beef burgers, chicken burgers, or vegetarian burgers) that essentially compete with each other. This form of product cannibalization (examining the demand for

competing products under the same brand) was intentionally omitted from this model for simplicity purposes.

The following attributes were used¹:

Attribute	Attribute Levels
Brand	McDonald's A&W Harvey's Wendy's Burger King Dairy Queen
Price	\$2.49 \$3.49 \$4.49 \$5.49
Type of burger	Regular burger Double burger Low fat burger Low fat double burger
Vegetarian / Real meat	Vegetarian – tastes like real meat Vegetarian – does not taste like real meat Real meat
Service	Ready immediately Ready within 2 minutes Ready within 5 minutes Ready within 10 minutes
Salad Bar	Salad bar included Salad bar \$1 extra Salad bar \$2 extra Salad bar \$4 extra No salad bar

Each respondent completed eight randomly generated and one fixed (or common across all respondents) choice tasks illustrating three alternatives. A sample choice task is illustrated in appendix 1.

The discrete choice model created in this study included a “none” options, sometimes referred to as the constant alternative. The “none” option in choice models better mimics the real world, since consumers are not required to choose products that do not satisfy them.

¹ The author is indebted to North Country Research Inc. (www.ncResearch.com) for making this data available.

Modeling decisions – Maximum Likelihood Estimation

Discrete choice models, in particular multinomial logit models, are well established in marketing and econometrics to study multiattribute choice decisions (Batsell and Louviere 1991). For the alternatives presented to respondents in this research, consumers were asked which alternative (if any) they would select for lunch. Therefore, the probability of selecting alternative i may be expressed as:

$$\Gamma = P (i | A) \quad -3-$$

Where Γ (deemed the Gamma function) is the probability of selecting alternative i from choice set A , of which i is a member.

Further,

$$\Gamma = \exp (V_i) / \sum_j \exp [V (j)] \quad -4-$$

where all terms are previously defined except for \exp , which is the exponential form that means “ e raised to the x power”. Equation four states that the probability of choosing alternative i from choice set A is proportional to the ratio of the exponential utility of i , relative to the sum of all the exponential utilities in set A . The model, however, is incomplete, because we need to specify some form for the V 's in equation four. The non-stochastic (or non random) utility component of a particular brand extension, V_i , may be expressed as the following (Ben-Akiva and Lerman 1985, and Louviere et al. 2000).

Model representing the main effects only:

$$V_i = \beta_b \text{Brand}_i + \beta_p \text{Price}_i + \beta_t \text{Burger_Type}_i + \beta_v \text{Vegetarian}_i + \beta_s \text{Service}_i + \beta_l \text{Salad}_i \quad -5-$$

Model representing both direct brand effects and indirect marketing mix effects:

$$V_i = \beta_b \text{Brand}_i + \beta_p \text{Price}_i + \beta_t \text{Burger_Type}_i + \beta_v \text{Vegetarian}_i + \beta_s \text{Service}_i + \beta_l \text{Salad}_i + (\beta_{bp} \text{Brand}_i \times \text{Price}_i) + (\beta_{bt} \text{Brand}_i \times \text{Burger_Type}_i) + (\beta_{bv} \text{Brand}_i \times \text{Vegetarian}_i) + (\beta_{bs} \text{Brand}_i \times \text{Service}_i) + (\beta_{bl} \text{Brand}_i \times \text{Salad}_i) \quad -6-$$

where V_i is the consumers systematic utility of product i ; Brand_i is the dummy for brand name of the quick service restaurant of product i ; Price_i is the price of product i ; Burger_Type_i is the type of burger (regular, low fat, single or double) of product i ; Vegetarian_i is the type of burger patty used (vegetarian – tastes like meat, vegetarian – does not taste like meat, or real meat) for product i ; Service_i is the service delivery time (ready immediately, or ready in 2, 5, or 10 minutes) for product i ; Salad_i is the type of salad available (none, free, or available for \$1, \$2, or \$4 extra) for product i ; β_b is the generic brand sensitivity across brands; β_p is the generic price sensitivity across brands; β_t is the generic burger type sensitivity across brands; β_v is the generic burger patty type across

brands; β_s is the generic service delivery time across brands; β_l is the generic salad bar sensitivity across brands; β_{bt} is the brand specific component of burger type sensitivity; β_{bv} is the brand specific component of burger patty type sensitivity; β_{bs} is the brand specific component of service delivery time sensitivity; and finally β_{bl} is the brand specific component of salad bar sensitivity.

Results

Main Effects of Attributes:

Attribute	Attribute Levels	Utility effect	T Ratio
Brand	McDonald's	-0.08290	-0.83515
	A&W	0.16390	1.77178
	Harvey's	0.21603	2.22783
	Wendy's	0.12097	1.15583
	Burger King	0.18352	1.85040
	Dairy Queen	-0.60153	-4.84692
Price	\$2.49	0.43043	5.78263
	\$3.49	0.13095	1.69643
	\$4.49	-0.07053	-0.89290
	\$5.49	-0.49035	-5.51782
Type of burger	Regular burger	-0.05582	-0.73352
	Double burger	-0.01659	-0.21243
	Low fat burger	0.15041	1.92544
	Low fat double burger	-0.07821	-0.94040
Vegetarian / Real meat	Vegetarian – tastes like real meat	-0.10330	-1.57380
	Vegetarian – does not taste like real meat	-0.70445	-9.22123
	Real meat	0.80775	12.93520
Service	Ready immediately	0.30339	4.10521
	Ready within 2 minutes	0.32216	4.21746
	Ready within 5 minutes	0.03626	0.46176
	Ready within 10 minutes	-0.66181	-6.84959
Salad Bar	Salad bar included	0.47008	5.37770
	Salad bar \$1 extra	0.22022	2.43940
	Salad bar \$2 extra	-0.03433	-0.39109
	Salad bar \$4 extra	-0.47795	-4.59881
	No salad bar	-0.17802	-1.93241

For the most part, utility effects are behaving rationally. Specifically discussing each attribute:

- Brand: the brand with the highest utility effect (deemed brand equity) is Harvey's, and the lowest brand equity effect is Dairy Queen;
- Price: utility levels decrease as prices increase;
- Burger type: utility is highest for a single patty low fat burger, indicating a confirmation of the importance of healthier alternatives;

- Vegetarian: utility is highest for the regular meat burger, however, the vegetarian option that tastes like real meat has a significantly higher utility than the vegetarian option that does not taste like real meat;
- Service: the preferred service option is having a sandwich available within two minutes, in fact this option is marginally preferred over having the burger ready (and therefore presumably waiting) immediately. Utility effects decrease as waiting time increases; and
- Salad bar: the utility is highest for a free salad bar, and decreases as the price of the salad bar increases. The absence of a salad bar entirely contributes negatively to overall utility.

The model measuring the two-way, brand specific affects – as outlined in equation 6 – is included in appendix 2.

Predictive validity of the multinomial logit model

As indicated above, all respondents completed eight randomly generated and one fixed choice task. The fixed choice task, common across all respondents, is often used as a hold out task to test the predictive validity of multinomial logit models (Horowitz and Louviere 1993). Horowitz and Louviere evaluate discrete choice models and deem them to have a good finite-sample properties and predictive validity. If the multinomial logit model developed from the results is accurate, it should predict the selections in the fixed hold out task (which is not used in creating the overall model). The share of preference results, derived from equation four, of this comparison, and the fixed task included, are illustrated below:

	McDonald’s \$2.49 Regular burger Real Meal Ready immediately Salad bar \$2 extra	A&W \$3.49 Double burger Real Meat Ready within 2 minutes No salad bar	Harvey’s \$4.49 Low fat burger Vegetarian (tastes like real meat) Ready within 5 minutes Salad bar included
Fixed task count	36.17%	34.22%	29.61%
Main effects	41.16%	35.89%	22.95%
Two way effects	38.21%	34.60%	27.19%

The “fixed task count row” is simply the frequency count of choices for the fixed hold out task². For instance, the A&W alternative was selected by 34.22% of the respondents. The next two rows are the predictive forecasts using the utilities derived from the model, and incorporated with the Gamma function represented by equations 3 and 4 above. The main effects row is simply the overall utility effects as represented by the non-stochastic

² The actual frequency counts included a no choice option (which, in this case, was selected by 17.7% of the respondents). However, the no choice option was not included in the model; therefore, the remaining percentages for the three alternatives are adjusted accordingly.

utility component from equation 5. Although the predictive capability of the main effects model is accurate for A&W, it overstates the importance of the McDonald's alternative, and understates the performance of the Harvey's alternative. The two way effects model (created by including the main effects, but also modeling for additional brand specific components of the product mix) with the non-stochastic elements identified in equation 7, produces an extremely accurate model that very closely forecasts actual performance. This indicates that the model is stable and reliable.

Importance of brand as a factor influencing behaviour

There has been some discussion in the marketing literature about the importance of a brand or brand equity in affecting consumer behaviour. While most of the work in this field (Boisvert and Coderre 2000) involves measuring brand equity according to (a) perceptual assets, (b) attitudinal assets, (c) financial value, or (d) behaviour assets, very little has examined the effect of brand equity, specifically calculated using a multinomial logit model. Swait et al (1993) being the exception; they previously demonstrated how to quantify the value of a brand name using only price differences.

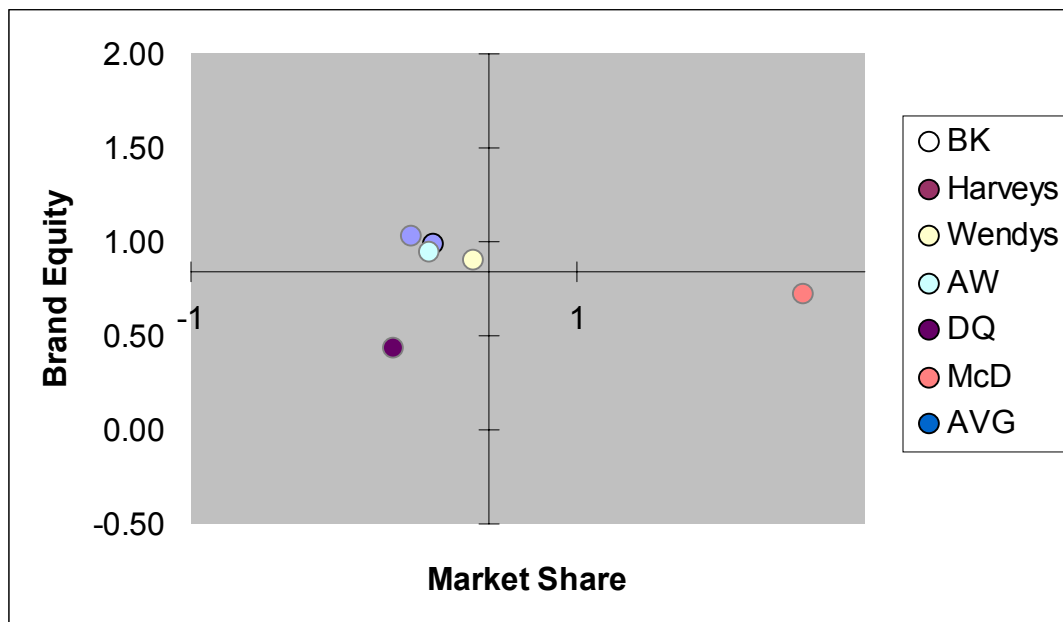
While others may believe that brand equity can be observed and measured through an eclectic combination of attitudinal questions, the ability to determine how a given brand affects the behaviour of an individual consumer appears more relevant for the marketing manager.

Almost every marketer will have a different definition of brand equity. A brand possesses equity to the extent that consumers are familiar with the brand, and that they have stored in their memory warehouses associations with the brand (whether these associations are strong or weak, favorable or not).

For a brand to be strong, it must accomplish two things over time: retain existing customers and attract new ones. To the extent that a brand does these things well, it will grow stronger relative to the competition. Therefore, the author proposes that brand equity (or perhaps brand utility) can be thought of as the differential effect that brand knowledge or perception has on the consumer response to marketing activity. This definition is important because it links the relationship of the brand directly with consumer behaviour; a brand with significant equity should influence consumer choice. Therefore, the utility effect for the brand attribute in a multinomial logit model serves as an effective proxy of brand equity, because it quantifies the effect a given brand has on consumer choice behaviour, relative to its competitors.

The concept of brand equity is fundamentally different than "brand awareness". Brand awareness is the question of whether a brand name comes to mind when consumers think about a particular product category, and the ease with which the name is evoked. Brand awareness may be influenced heavily by marketing communication and distribution, but positive brand awareness may not necessarily be correlated with positive brand equity.

The importance of this relationship is illustrated in the graph below.



This graph illustrates the relationship between brand equity and market share. In this study, respondents were asked to indicate which quick service restaurant they last ate at. This response will serve as a proxy for market share or brand awareness measure. Alternatively, the brand equity effect from the multinomial logit model serves as the equity share. Since the utility effects from the logit model are zero centered, each attribute level was exponentiated (that is to x was raised to the power e in the form e^x). Like the Boston Consulting Group matrix (which displays market share against industry growth or cash use), both the market share and brand equity effects are illustrations relative to the market leader for that measure.

Therefore, the most effective brand would have both strong brand equity and strong market position, and would operate in the top right of the graph above; it should be the goal of firms to move into this position.

Burger King³ has extremely strong brand equity, but lower market presence. There are several things that might be holding a brand back. It may have strong equity, but lack an effective distribution mechanism, thereby holding back market share. McDonald's, operating with strong market share, but weaker brand equity is also under-performing from a brand equity perspective. The weakest brand in this study is Dairy Queen, characterized by weak brand equity and weak market share.

This model may seem paradoxical to the reader. How, for example, could McDonald's have the highest level of market share, but lower brand equity? Shouldn't there be a causal relationship between market share and brand equity? Not necessarily. Some brands

³ Burger King was arbitrarily selected from Harvey's, Wendy's and A&W to represent the brands with the highest equity. Any of these brands could have been selected.

may achieve market strength (through effective positioning on price, product, place or promotion) without having the equity that by itself also affects consumer choice. At one extreme, consider monopolies; these organizations have strength purely by the size of their share of the market, yet their brands may not necessarily drive consumer behaviour.

In this sense, the McDonald's brand, strictly related to the context of this experimental group (namely young adults), is not in and of itself a positive influence on the choice of lunch selection. Recall that brand equity is the effect that brand knowledge or perception has on the consumer's response. In the context of this experiment, Burger King is perceived to have a stronger effect than McDonald's (the market share leader) or Dairy Queen (who has the lowest market share and equity). Considering the positioning of McDonald's to young families, it would not be surprising to see McDonald's lead in both brand equity and market size if the same survey was administered to adults with small families instead of young adults.

Discussion of the results

The results of this paper clearly do not support the first hypothesis (that the market will accept this introduction of healthier product offerings). The t-ratios for type of burger (regular burger, double burger, low fat burger or double low fat burger) indicate that this variable does not have a statistically significant influence on consumer behaviour, and therefore was removed from subsequent analysis.

Although the variables for type of burger (real meat, vegetarian tasting like real meat, and vegetarian not tasting like real meat) were statistically significant, the market clearly favors burgers made from real meat. Thus the first hypothesis must be rejected.

Possible product extensions for the equity leader (Burger King) will be examined in greater detail below. The decision to focus on this single supplier is somewhat arbitrary, since the model could be used to examine the effects of product changes introduced by any competitor. Further, even if the analysis is limited to evaluating the introduction of new products by only one competitor, there are a wide range of possible product alternative combinations available. Consider, for example, the exhaustive introduction of new products defined by the combination of price, salad bar, type of burger, and vegetarian levels defined in the model; this results in a total of $4 \times 5 \times 4 \times 3 = 240$ unique service offerings for Burger King alone. Space limitations constrain the analysis to a limited selection of new product opportunities.

Establishment of a base case scenario

In order to proceed with the analysis, it is necessary to establish a base case scenario upon which future product changes can be compared against. For the sake of consistency, each alternative will have identical products (features, burger types, prices and delivery time). While this seems artificial, since all products are identical, it provides a comprehensive and equal starting point for further evaluation.

The base case and resulting share of preference figures (obtained from equation 4 above) are:

McDonald's \$3.49 Regular burger Real meat Ready within 2 min No salad bar 15.72%	A&W \$3.49 Regular burger Real meat Ready within 2 min No salad bar 14.40%	Harvey's \$3.49 Regular burger Real meat Ready within 2 min No salad bar 18.66%	Wendy's \$3.49 Regular burger Real meat Ready within 2 min No salad bar 9.67%	Burger King \$3.49 Regular burger Real meat Ready within 2 min No salad bar 37.00%	Dairy Queen \$3.49 Regular burger Real meat Ready within 2 min No salad bar 4.56%
---	--	---	---	--	---

There are almost limitless numbers of possible “what if” scenarios that could be examined in subsequent analysis. This paper will focus on the following scenarios:

- The introduction of a \$2 salad bar offered by Burger King (the brand equity leader); other competitors remain the same.
- The retaliation by McDonalds to \$2 salad bar offered by Burger King with an identical product offering; other competitors remain the same.
- The introduction of a separate \$2 salad bar offered by McDonald's (the market share leader); other competitors remain the same.

Salad bar introduced by Burger King:

Should Burger King, the brand equity leader introduce a healthy option (the inclusion of a salad bar for \$2), while other competitors remain the same, the scenarios would look like:

McDonald's \$3.49 Regular burger Real meat Ready within 2 min No salad bar 15.72%	A&W \$3.49 Regular burger Real meat Ready within 2 min No salad bar 14.40%	Harvey's \$3.49 Regular burger Real meat Ready within 2 min No salad bar 18.66%	Wendy's \$3.49 Regular burger Real meat Ready within 2 min No salad bar 9.67%	Burger King \$3.49 Regular burger Real meat Ready within 2 min Salad bar \$2 37.00%	Dairy Queen \$3.49 Regular burger Real meat Ready within 2 min No salad bar 4.56%
12.26%	10.59%	15.37%	6.12%	53.50%	2.15%

Note: the change in share of preference for this change is reflected by the last row of numbers. The original base share of preference figures are included for reference only. Product changes indicated in red above.

Should Burger King introduce a \$2 salad bar, overall share of preference increases nearly twenty percentage points to 53.50%. This is a 44.59% increase in share of preference.

Salad bar introduced by McDonald's:

Alternatively, should the market share leader introduce the same healthy alternative, while other competitors remain the same, the shares of preference would look like:

McDonald's \$3.49 Regular burger Real meat Ready within 2 min Salad bar \$2	A&W \$3.49 Regular burger Real meat Ready within 2 min No salad bar	Harvey's \$3.49 Regular burger Real meat Ready within 2 min No salad bar	Wendy's \$3.49 Regular burger Real meat Ready within 2 min No salad bar	Burger King \$3.49 Regular burger Real meat Ready within 2 min No salad bar	Dairy Queen \$3.49 Regular burger Real meat Ready within 2 min No salad bar
15.72%	14.40%	18.66%	9.67%	37.00%	4.56%
23.11%	11.03%	15.82%	6.36%	41.47%	2.21%

Note: the change in share of preference for this change is reflected by the last row of numbers. The original base share of preference figures are included for reference only. Product changes indicated in red above.

The marketplace also favors the addition of a \$2 salad bar option introduced by McDonald's. The share of preference for McDonald's increases over seven percentage points to 23.11%. This reflects a 47% increase in share of preference. However, the share of preference for Burger King also increases marginally indicating the presence of minor brand cross effects; the product change from McDonald's is driving a small portion of customers to Burger King.

Salad bar introduced by Burger King and McDonald's:

Should both Burger King and McDonald's introduce a salad bar, the scenarios would look like:

McDonald's \$3.49 Regular burger Real meat Ready within 2 min Salad bar \$2	A&W \$3.49 Regular burger Real meat Ready within 2 min No salad bar	Harvey's \$3.49 Regular burger Real meat Ready within 2 min No salad bar	Wendy's \$3.49 Regular burger Real meat Ready within 2 min No salad bar	Burger King \$3.49 Regular burger Real meat Ready within 2 min Salad bar \$2	Dairy Queen \$3.49 Regular burger Real meat Ready within 2 min No salad bar
15.72%	14.40%	18.66%	9.67%	37.00%	4.56%
10.95%	11.83%	17.13%	6.97%	50.74%	2.38%

Note: the change in share of preference for this change is reflected by the last row of numbers. The original base share of preference figures are included for reference only. Product changes indicated in red above.

A competitive new product launch, where both the brand equity leader and the market share leader introduce the same product extension, results in significant share of preference increases for Burger King to 50.74% and a corresponding share of preference decrease for McDonald's (to 10.95%).

McDonald's will improve share of preference among the targeted consumers if their product extension is introduced in isolation. Burger King, on the other hand, realizes an increased share of preference if they introduce a \$2 salad bar irrespective of competitive responses from McDonald's.

These results support the second and third hypotheses presented in this paper, namely that brand equity influences the success of product extensions, and that the optimal strategy for the equity and market share leaders will differ.

Finally, the results can be used to determine the desirability for new product introductions themselves. By identifying the possible market acceptance for such extensions, a cost benefit analysis can be undertaken to specifically examine the economics behind such actions. For example, if the cost to Burger King of introducing and maintaining – including fixed and variable costs – a salad bar are less than \$2/unit, then Burger King could benefit from such an introduction.

Conclusion

This paper examined how stated choice discrete choice modeling can be used to examine the market response of a new product introduction. Discrete choice modeling is an effective technique for examining market responses to given product changes prior to actually making the introduction.

Despite claims by Health Canada that young adults are increasingly seeking a reduced fat diet, there is little evidence that this segment supports the introduction of a low-fat burger offered by any Canadian quick service restaurant.

Further, the results identified that the market acceptance of a new product introduction depends on who is making the product introduction. It was found that a major distinction exists in the desirability of new product introductions depending on which competitor (the market share leader, or the brand equity leader) makes the introduction.

The results also reveal the importance of determining possible competitive consequences in the strategy of new product launches, especially among products that are easy for competitors to imitate. While a product introduction may be accepted positively by several competitors acting in isolation, this study concludes that in the event of simultaneous new product introductions, that the brand equity leader will be better off, while the market share leader will be overall worse off.

The examination of an optimal product extension strategy in a competitive marketplace among brand and market share leaders should be examined further in subsequent research.

Works Cited:

- Aaker, David (1991), "Managing Brand Equity", New York, Free Press
- Aaker, David, (1996) "Measuring Brand Equity Across Products and Markets", *California Management Review*, Vol. 38 (3), Spring.
- Bastell, R. R. (1980), "Consumer Resource Allocation Models at the Individual Level", *Journal of Consumer Research*, Vol. 7, pp. 78- 87.
- Bastell, R. R. and L. M. Lodish (1981), "A Model and Measurement Methodology for Predicting Individual Consumer Choice", *Journal of Marketing Research*, February, Vol. 18, pp. 1 – 12.
- Bastell, R. R. and Jordan J. Louviere (1991), "Experimental Analysis of Choice", *Marketing Letters*, August, Vol. 2, pp. 199 – 214.
- Ben-Akiva, Moshe and Steve Lerman, (1985), "Discrete Choice Analysis: Theory and Applications to Travel Demand", MIT Press, Cambridge, MA.
- Bolduc, Denis and Guy Lacroix (1997) "The choice of medical providers in rural Benin: A comparison of discrete choice models", *Journal of Health Economics*, Vol.15 (4).
- Boisvert, Jean, and Francois Coderre (2000) "Toward a better understanding of brand equity", *Canadian Journal of Marketing Research*, Vol. 19, pp. 37 – 45.
- Collins-Dodd, Colleen and Jordan J. Louviere (1999), "Brand Equity and Retailer Acceptance of Brand Extensions", *Journal of Retailing and Consumer Services*, January Vol. 6 (1), pp. 1 – 13.
- Cooper, Andrew B and Joshua Millsbaugh, (1999) "The Application of Discrete Choice Models to Wildlife Resource Selection Studies", *Ecology*, March, Vol. 80 (2).
- Currim, I. S. (1981), "Using Segmentation Approaches for Better Prediction and Understanding from Consumer Choice Models", *Journal of Marketing Research*, Vol. 18, pp. 301 – 309.
- Currim, I. S. (1982), "Predictive Testing of Consumer Choice Models not Subject to Independence of Irrelevant Alternatives", *Journal of Marketing Research*, Vol. 19, pp. 208 – 222.
- Erdem, Tulin and Swait, Joffre, 1998, "Brand Equity as a Signaling Phenomenon", *Journal of Consumer Psychology*, Vol. 7(2), pp. 131-157.
- Farquhar, P H, (1989), "Managing Brand Equity", *Marketing Research*, 1, pp. 24 – 39.

Glowa, Tim, (2001a) “Understanding how consumers make complex choices”, *Unpublished white paper*, November, available at www.glowa.ca

Glowa, Tim (2001b) “The North Country Research Approach to Consumer Choice Modeling”, *Unpublished white paper*, North Country Research Inc., July

Health Canada, (1997) “Canadian’s and Healthy Eating: How are we doing”, from the National Population Health Survey, 1994 – 1995.

Horowitz, Joel and Louviere, Jordan J., (1993), “Testing predicted choices against observations in probabilistic discrete choice models”, *Marketing Science*, Vol. 12(3).

Louviere, Jordan J., (1983), “Integrating Conjoint and Functional Measurement with Discrete Choice Theory”, in Richard P. Bagozzi and Alice M. Thybouts (eds.) *Advances in Consumer Research*, vol. 10, Ann Arbor, Michigan: Association for Consumer Research, pp. 151 – 156.

Louviere, Jordan J., and David A. Hensher (1982), “On the Design and Analysis of Simulated Choice or Allocation Experiments in Travel Choice Modeling”, *Transportation Research Record No. 890*, pp. 11 – 17.

Louviere, Jordan J., (1984), “Using Discrete Choice Experiments and Multinomial Logit Choice Models to Forecast Trial in a Competitive Retail Environment: A Fast Food Illustration”, *Journal of Retailing*, Vol. 60 (4), Winter.

Louviere, Jordan J., (1988), “Analyzing Decision Making: Metric Conjoint Analysis”, Sage Publications (paper 67), Newbury Park, CA.

Louviere, Jordan J., David Hensher, and Joffre Swait, (2000) “Stated Choice Methods: Analysis and Application”, Cambridge University Press, Cambridge UK.

Mahajan, V., P. E. Green and S. M. Goldberg (1982), “A Conjoint Model for Measuring Self and Cross Price / Demand Relationships”, *Journal of Marketing Research*, August, Vol. 19, pp. 334 – 342.

Mathews, Anna, (2001), October 18, “To Join or Not to Join”, *Wall Street Journal*, *Wall Street Journal*, page B1.

McFadden, Daniel (1974), “Conditional Logit Analysis of Quantitative Choice Behaviour” in Paul Zarembka (ed.) *Frontiers of Econometrics*, New York: Academic Press, pp. 105 – 142.

McFadden, Daniel (1981), “Econometric Models of Probabilistic Choice”, in Manski, C., and McFadden, D (eds.), *Structural Analysis of Discrete Data with Econometric Applications*, Cambridge, MA: MIT Press, pp. 198 – 272.

Montgomery, C. A., and B. Wernerfelt, (1992), "Risk Reduction and Umbrella Branding", *Journal of Business*, Vol. 65 (1), pp. 31 – 50.

Orme, Bryan K., and Michael Heft, (2000) "Predicting actual sales with choice-based conjoint: How capturing heterogeneity improves results", *Canadian Journal of Marketing Research*, Vol. 19, pp. 54 – 63.

Palmquist, Raymond B., and Adis Israngkura (1999) "Valuing Air Quality with Hedonic and Discrete Choice Models", *American Journal of Agricultural Economics*, vol. 81(5).

Riggington, Geoff and Colin Sinclair (2000) "Modeling Choice and Switching Behavior between Scottish Ski Centres", *Applied Economics*, vol. 32(8).

Sappington, D and B. Wernerfelt (1985), "To Brand or Not to Brand? A Theoretical and Empirical Question", *Journal of Business*, Vol. 58 (3), pp. 279 – 293.

Schocker, A D, Srivastava, R K, and Ruekert, R W, (1994), "Challenges and Opportunities Facing Brand Management: An Introduction to the Special Issue", *Journal of Marketing Research*, 31, pp. 149 – 158.

Smith, D. C., and C. W. Park (1992), "The Effect of Brand Extensions on Market Share and Advertising Efficiency", *Journal of Marketing Research*, August, Vol. 29, pp. 269 – 313.

Swait, Joffe, Tulin Erdem, Jordan J. Louviere, and Chris Dubelaar (1993), "The Equalization Price: A Measure of Consumer Perceived Brand Equity", *International Journal of Research in Marketing*, March, Vol. 10 (1).

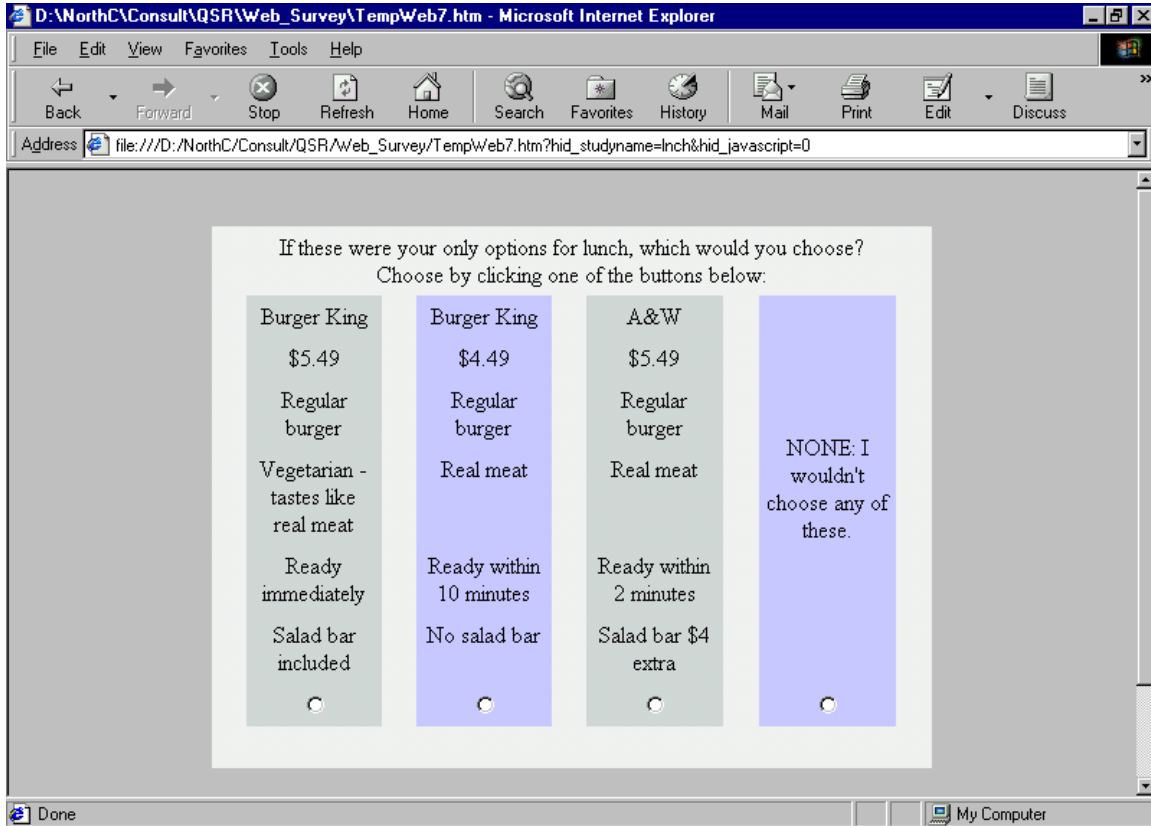
Thurstone, L. L. (1927), "A Law of Comparative Judgment", *Psychological Review*, Vol. 34, pp. 273 – 286.

Wernerfelt, B., (1988), "Umbrella Branding as a Signal of New Product Quality as an Example of Signalling by Posting a Bond", *RAND Journal of Economics*, Autumn, Vol. 19, pp. 458 – 466.

Wright, Len and Nancarrow, Clive, (1999) "Researching International Brand Equity: A Case Study", *International Marketing Review*, Vol. 16 (4/5), pp. 417 – 431.

Appendix 1

One sample choice task is included below:



Appendix 2 – Model Results (Two Way Effects)

	Effect	Std Err	t Ratio	Attribute Level
1	0.11009	0.11452	0.96132	1 1 McDonald's
2	0.19506	0.11355	1.71782	1 2 A&W
3	0.09649	0.12055	0.80040	1 3 Harvey's
4	-0.00311	0.12603	-0.02465	1 4 Wendy's
5	0.15691	0.11844	1.32487	1 5 Burger King
6	-0.55544	0.14858	-3.73829	1 6 Dairy Queen
7	0.47341	0.07917	5.97961	2 1 \$2.49
8	0.12182	0.08396	1.45099	2 2 \$3.49
9	-0.14494	0.08695	-1.66702	2 3 \$4.49
10	-0.45029	0.09400	-4.79028	2 4 \$5.49
11	-0.11256	0.07046	-1.59760	4 1 Vegetarian - tastes like real meat
12	-0.73558	0.08047	-9.14136	4 2 Vegetarian - does not taste like real meat
13	0.84814	0.06753	12.56013	4 3 Real meat
14	0.35301	0.07835	4.50574	5 1 Ready immediately
15	0.34110	0.08310	4.10473	5 2 Ready within 2 minutes
16	-0.02485	0.08515	-0.29187	5 3 Ready within 5 minutes
17	-0.66926	0.10161	-6.58637	5 4 Ready within 10 minutes
18	0.47350	0.09509	4.97946	6 1 Salad bar included
19	0.20971	0.09580	2.18908	6 2 Salad bar \$1 extra
20	-0.02935	0.09497	-0.30906	6 3 Salad bar \$2 extra
21	-0.48839	0.11053	-4.41847	6 4 Salad bar \$4 extra
22	-0.16547	0.10588	-1.56283	6 5 No salad bar
23	-0.13321	0.16422	-0.81114	McDonald's by \$2.49
24	-0.03505	0.18629	-0.18813	McDonald's by \$3.49
25	0.05071	0.18397	0.27563	McDonald's by \$4.49
26	0.11755	0.20680	0.56841	McDonald's by \$5.49
27	0.29197	0.16605	1.75835	A&W by \$2.49
28	0.02838	0.15764	0.18006	A&W by \$3.49
29	-0.37247	0.18710	-1.99076	A&W by \$4.49
30	0.05212	0.19957	0.26115	A&W by \$5.49
31	-0.18126	0.18091	-1.00195	Harvey's by \$2.49
32	-0.03905	0.18836	-0.20729	Harvey's by \$3.49
33	0.30948	0.17251	1.79398	Harvey's by \$4.49
34	-0.08917	0.20483	-0.43532	Harvey's by \$5.49
35	-0.03443	0.17978	-0.19149	Wendy's by \$2.49
36	-0.13568	0.18974	-0.71508	Wendy's by \$3.49
37	-0.06609	0.19828	-0.33332	Wendy's by \$4.49
38	0.23620	0.19107	1.23619	Wendy's by \$5.49
39	-0.03139	0.17186	-0.18264	Burger King by \$2.49
40	0.12936	0.17606	0.73473	Burger King by \$3.49
41	0.28398	0.18524	1.53308	Burger King by \$4.49
42	-0.38195	0.21358	-1.78830	Burger King by \$5.49
43	0.08831	0.19731	0.44759	Dairy Queen by \$2.49
44	0.05203	0.21813	0.23852	Dairy Queen by \$3.49
45	-0.20560	0.23822	-0.86310	Dairy Queen by \$4.49
46	0.06526	0.24622	0.26505	Dairy Queen by \$5.49
47	-0.19790	0.15795	-1.25293	McDonald's by Vegetarian - tastes like real meat
48	0.24792	0.16441	1.50790	McDonald's by Vegetarian - does not taste like real
49	-0.05002	0.14141	-0.35372	McDonald's by Real meat
50	-0.00618	0.14306	-0.04321	A&W by Vegetarian - tastes like real meat
51	-0.11568	0.16780	-0.68940	A&W by Vegetarian - does not taste like real meat
52	0.12187	0.13873	0.87845	A&W by Real meat
53	0.04675	0.15386	0.30382	Harvey's by Vegetarian - tastes like real meat
54	-0.12804	0.17788	-0.71982	Harvey's by Vegetarian - does not taste like real
55	0.08130	0.14667	0.55427	Harvey's by Real meat
56	0.11213	0.15327	0.73157	Wendy's by Vegetarian - tastes like real meat
57	-0.15935	0.18273	-0.87206	Wendy's by Vegetarian - does not taste like real
58	0.04722	0.15075	0.31323	Wendy's by Real meat
59	-0.16895	0.15437	-1.09445	Burger King by Vegetarian - tastes like real meat

60	0.10033	0.16743	0.59920	Burger King by Vegetarian - does not taste like real
61	0.06862	0.14122	0.48595	Burger King by Real meat
62	0.21415	0.18386	1.16475	Dairy Queen by Vegetarian - tastes like real meat
63	0.05484	0.20272	0.27051	Dairy Queen by Vegetarian - does not taste like real
64	-0.26899	0.17106	-1.57247	Dairy Queen by Real meat
65	-0.35271	0.16406	-2.14985	McDonald's by Ready immediately
66	-0.06840	0.18729	-0.36521	McDonald's by Ready within 2 minutes
67	0.12749	0.18676	0.68263	McDonald's by Ready within 5 minutes
68	0.29362	0.20011	1.46732	McDonald's by Ready within 10 minutes
69	-0.04818	0.16700	-0.28847	A&W by Ready immediately
70	-0.33262	0.15963	-2.08374	A&W by Ready within 2 minutes
71	0.14126	0.17140	0.82415	A&W by Ready within 5 minutes
72	0.23954	0.21084	1.13612	A&W by Ready within 10 minutes
73	0.11181	0.18043	0.61968	Harvey's by Ready immediately
74	0.10163	0.18559	0.54758	Harvey's by Ready within 2 minutes
75	-0.11927	0.18385	-0.64873	Harvey's by Ready within 5 minutes
76	-0.09417	0.21545	-0.43707	Harvey's by Ready within 10 minutes
77	0.46370	0.17693	2.62076	Wendy's by Ready immediately
78	-0.11545	0.18533	-0.62295	Wendy's by Ready within 2 minutes
79	-0.05663	0.19615	-0.28871	Wendy's by Ready within 5 minutes
80	-0.29161	0.22259	-1.31010	Wendy's by Ready within 10 minutes
81	-0.28112	0.17259	-1.62889	Burger King by Ready immediately
82	0.56271	0.17564	3.20378	Burger King by Ready within 2 minutes
83	-0.06050	0.18606	-0.32518	Burger King by Ready within 5 minutes
84	-0.22109	0.22674	-0.97508	Burger King by Ready within 10 minutes
85	0.10651	0.20179	0.52782	Dairy Queen by Ready immediately
86	-0.14787	0.21724	-0.68068	Dairy Queen by Ready within 2 minutes
87	-0.03235	0.22518	-0.14366	Dairy Queen by Ready within 5 minutes
88	0.07371	0.26724	0.27581	Dairy Queen by Ready within 10 minutes
89	-0.39811	0.21341	-1.86544	McDonald's by Salad bar included
90	-0.33846	0.21510	-1.57348	McDonald's by Salad bar \$1 extra
91	0.05792	0.18738	0.30910	McDonald's by Salad bar \$2 extra
92	0.49148	0.22194	2.21450	McDonald's by Salad bar \$4 extra
93	0.18717	0.21352	0.87662	McDonald's by No salad bar
94	0.06949	0.19748	0.35190	A&W by Salad bar included
95	-0.07135	0.20072	-0.35549	A&W by Salad bar \$1 extra
96	0.02267	0.20466	0.11076	A&W by Salad bar \$2 extra
97	-0.04580	0.22604	-0.20262	A&W by Salad bar \$4 extra
98	0.02499	0.18362	0.13610	A&W by No salad bar
99	0.34464	0.20418	1.68794	Harvey's by Salad bar included
100	0.16968	0.20403	0.83165	Harvey's by Salad bar \$1 extra
101	-0.27254	0.22352	-1.21927	Harvey's by Salad bar \$2 extra
102	-0.29294	0.23979	-1.22167	Harvey's by Salad bar \$4 extra
103	0.05115	0.22844	0.22392	Harvey's by No salad bar
104	-0.04764	0.21003	-0.22682	Wendy's by Salad bar included
105	0.20260	0.20282	0.99892	Wendy's by Salad bar \$1 extra
106	0.30945	0.21216	1.45858	Wendy's by Salad bar \$2 extra
107	-0.33249	0.25917	-1.28291	Wendy's by Salad bar \$4 extra
108	-0.13192	0.26521	-0.49742	Wendy's by No salad bar
109	-0.10161	0.21611	-0.47020	Burger King by Salad bar included
110	-0.08408	0.21503	-0.39103	Burger King by Salad bar \$1 extra
111	0.19548	0.19715	0.99152	Burger King by Salad bar \$2 extra
112	-0.08501	0.22976	-0.37001	Burger King by Salad bar \$4 extra
113	0.07523	0.20769	0.36225	Burger King by No salad bar
114	0.13322	0.22525	0.59145	Dairy Queen by Salad bar included
115	0.12161	0.24378	0.49885	Dairy Queen by Salad bar \$1 extra
116	-0.31297	0.25317	-1.23622	Dairy Queen by Salad bar \$2 extra
117	0.26477	0.28467	0.93009	Dairy Queen by Salad bar \$4 extra
118	-0.20663	0.30485	-0.67780	Dairy Queen by No salad bar
119	0.82325	0.07164	11.49172	NONE

Time for computation = 30 seconds.
