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Logit model involving demographic and psychographic variables

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Abstract

Research on private label brands started with focus on explaining the choice of private label brands by simple demographics variables which later expanded into work on attitudinal and behavioral characteristics of customers. However, all these studies had never tried to integrate demographic and psychographic variables to achieve a higher explanatory power, even though researchers had suggested that such a combination is likely to have a higher explanatory power. This paper, after a review of literature, identifies the variables for private label brand proneness. This is followed by mathematical explanation which provides the mathematical model using discrete choice modeling. The paper also provides operationalization of integrated model in current Indian retail scenario and concludes with explaining the limitations.

Key Words: private label brands, logit, retail, India

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Introduction

Store brands or private label brands are brands owned, controlled, and sold exclusively by a retailer (Baltas, 1997). Private label brands were first introduced over 100 years ago in a few product categories, such as tea and are now available in over 60 percent of all grocery categories in USA (Fitzell, 1982). The concept of private label brands was popularized by large corporate supermarket chains which expanded their private label business at the expense of some heavily advertised national brands and items (Stern, 1966). The experience of the post-war years has seen decline of weak manufacturers' brands (also called national brands), especially when not in the top three of a product category, in market share and even sometimes disappearing completely. While the major brands have strengthened their position somewhat, increasing retail concentration has put the brands owned by the large retailers into a strong position in a number of product categories (Morris & Nightingale, 1980). By 1990, private label brands had become the dominant brand for nearly 20 percent of US supermarket product categories (Richardson, Jain, & Dick, 1996).

Growth of organized retail chain in India has also led to growth of private label brands in India. Indian economy has seen average growth rate of more than seven percent since 1994, putting purchasing power in hands of customer. Though, initial growth of private label brands in India has been limited to certain categories like grocery and apparel, it is slowly expanding into other categories as well. The Indian retail market is the fifth largest retail destination globally and has been considered the most attractive emerging market for investment. Overall, the Indian retail market is growing at 30% annually, with the organized segment, which currently accounts for around 9% of the Indian retail market, registering above average growth of 30% (Report on Indian retail industry by Cygnus, 2010). Thus, with growth of organized retail in India, the private label brands are also expected to grow.

Research on private label brands has been of substantial interest to the marketing managers and academics. The growth of private label brands in India presents an interesting opportunity for the retail managers to understand the motivations behind choice of private labels. Previous work in choice of private label brands has reviewed the reasons from manufacturer's and retailers' point of view (Raju, Sethuraman, & Dhar, 1992; Hoch & Banerji 1993, Dhar & Hoch 1997) as well as consumers' point of view. Previous work done in examining the work from consumers's point of view started with

focus on explaining the choice of private label brands by simple demographics variables. Later on, as the demographic variables had poor explanatory power, researchers focused their work on attitudinal and behavioral characteristics of customers to determine the choice of private label brands. However, all these studies had never tried to integrate demographic and psychographic variables to achieve a higher explanatory power, even though researchers had suggested that such a combination is likely to have a higher explanatory power (Myers 1967, Baltas & Doyle 1998). In this paper, the objective will be to integrate the demographics and psychographics variables behind the choice of private label brands.

This paper starts with a review of the previous work done in area of demographic and psychographic explanation for purchase of private label brands. After a thorough review of literature, the variables suggested through literature are identified. Thereafter, the paper highlights the need to integrate the variables for higher explanatory power. This is followed by mathematical explanation which will explain the basis of integration and build the mathematical model using discrete choice models. The paper also provides for operationalization of integrated model in current Indian retail scenario. The paper concludes by providing limitations.

Literature review – Private label brands choice

As mentioned earlier, the previous work in area of private label brands has focused on demographic variables and consumer attitudes and behavior variables. The paper will start with review of studies in demographic variables as the initial work focused on this area before moving on into psychographic variables. The main objectives of all such studies had been to specify variables so that market segment could be identified. Interest had centered on uncovering stable person and product characteristics related to private label brands and consumer demographic and psychographic were considered in purchase decisions (Szymanski & Busch, 1987).

The bulk of studies examining the characteristics of the private label brand buyers have attempted to discover whether the propensity to buy the private label brand is associated with demographic or socio-economic characteristics of customers. Frank and Boyd (1965) were the first to examine the nature of household demand for privately branded grocery products. They conducted research on 44 grocery product categories to determine the extent to which socio-economic, consumption, and store shopping habits

distinguished manufacturer brands customers from private label brand prone customers. The study was conducted using multiple regression and tried to predict private label brand proneness using fourteen socio-economic characteristics as independent variables. These included number of persons in the family, number of adults in the family, age of female head, age of youngest child, housewife employment, income, occupation, education, number of cars, number of TV sets, religion of household heads, race of household heads, building size, and housewife status. The findings suggested that there was no difference between the households consuming private label brands and manufacturer brands and these households shared the same socio-economic and total consumption characteristics.

Coe (1971) conducted a study to determine the differential preference between national and private label brands among lower and middle income customers. The study indicated that there were substantial differences between the two income group regarding their brand preference. While determining the factors among the listed variables she concluded that three factors i.e. education, awareness and acceptability of advertising, and price tended to differentiate the lower-income and middle-income consumers.

Burger and Schott (1972) examined if meaningful segments could be created using a model of consumer behavior including demographic, product class salience, product use, and marketing attitude variables. The study intended to extend previous work by adding other variables to the demographic variables which included social class and income. The analysis based on data from 247 women consumers across two product categories revealed that private label buyers were spread across all socio-economic groups (i.e. demographic variables were absent). They proposed that differences in attitudinal and behavioral variables were better predictors.

A meta-analysis by Szymanski and Busch (1987) was conducted to overcome the inconsistencies in findings due to diversity in statistics used to report individual search results. In the analysis, they listed the most common demographic variables mentioned in previous studies as income, family size, age, education, marital status, sex, occupation, housing and race. They also mentioned that among the demographic variables studied, income and family size were most frequently studied. The study also discussed about other categories of independent variables which included shopping behaviors, product perceptions, and psychographic factors apart from demographic factors. Furthermore, the

meta-analysis showed that demographic variables were related only weakly to consumers' proneness for purchases.

The work on using demographic variables to explain consumer segmentation provided some useful insights for possible market segmentation. However, they were unable to address the central managerial question of why private brands or national brands were preferred over other. The study focusing on psychographic variables was expected to fill this gap.

The studies on psychographic variables started with the work by Myers (1967). He proposed that consumers can be best classified by their perceptions towards the private label rather than individual characteristics such as personality variables or socio economic factors. The basic methodological feature of the study was development of attitudinal construct which could provide useful criteria for identifying differences in consumer type. The study showed low predictive power of socio-economic and personality determinants and suggested need for further theoretical and empirical investigation.

Livesey and Lennon (1978), after accepting the difficulty in constructing a theory which explained the difference in consumer behavior with respect to consumer's choice of private label brands and manufacturer brands, tried to explain the differences based on perception differences. They listed purchasing experience (i.e. degree of experience with store brands), differential response to marketing activities, differences in consumer needs, perceived risk, and different product importance among consumers as variables for perception differences. The results showed that for particular products, differences in consumer needs constituted an important explanatory variable.

Burger and Schott (1972) while proposing that differences in attitudinal and behavioral variables were better predictors, listed three factors namely price attitude, advertising attitude, and careful shopping for explaining the behavioral differences of consumers with respect to private label brand purchase and manufacturer brand purchase. The three factors were generated from fourteen variables base done earlier work by Douglas Tigert. They concluded that advertising attitude and careful shopping were not important variables differentiating the private label brands and manufacturer brand segments.

In more recent times, Richardson et al. (1996) presented a framework for determining private label brand proneness. Building upon their earlier work done on examining the relative importance of extrinsic versus extrinsic cues in determining private label brand proneness, they proposed certain individual difference variables such as degree of reliance by the customer on extrinsic cues and customers' tolerance of ambiguity as well as consumer perceptions of the particular category (degree of perceived quality variations, level of perceived risks, and perceived value for money) as correlates of private brand proneness. They also suggested income, family size, age and education as correlates of private brand proneness.

Taking the research on the topic further, Baltas (1997) talked about poor explanatory power of simple demographic variable in previous research and attempt to provide a framework of consumer characteristics that affect private label brand buying. The framework was developed using attitudinal and behavioral characteristics. The data was collected on thirteen independent variables which fell into four main categories namely shopping behavior, reasons for buying store brands, indicators of consumer relationships with store brands, and consumer involvement with category. The results suggested that heterogeneous models, were better predictors of private label brand proneness.

Batra and Sinha (2000) examined the different determinants of perceived risk to explain the variations in purchasing preferences for national brands versus private label brands. They state that little consumer-level research has tried to explain these crucial variations across categories and their focus is in identifying the role of "search" versus "experience" attributes in shaping the degree of such perceived risk in the product category. The findings suggested that consumers were more likely to purchase private label brands that have more "search" attributes and less likely to buy it if the category had many experience befits, ones not easily described on the package label.

One of the most recent studies was on cross-cultural study of private label shopping attitudes and behavior (Shannon & Mandhachitara, 2005). Their study attempted to understand the attitudinal and behavioral factors associated with private-label grocery shopping through simultaneous surveys among customers in two countries of USA and Thailand. Specifically, they examined the independent variables namely private-label brand familiarity, perceived quality differences, perceived private label risk, time pressure, shopping enjoyment, shopping group size, price signaling and extrinsic cue

reliance. The results suggested that there were differences across the customers based on attitudinal and behavioral factors.

These studies focusing on identifying the factors behind private label proneness suggest the following:

- The demographic variables, though they were not able to explain customer behavior with respect to private label purchase, were able to provide useful insights.
- The demographic variables important for customer behavior for private brand purchase were “age”, “education”, “income”, and “family size”.
- The psychographic variables were able to provide better explanation for private brand purchase by consumers.
- Based on the review of literature made earlier, the important variables included in the list of psychographic variables consisted of following:
  - Purchasing experience (i.e. experience with private label brands, also called private label brand familiarity)
  - Differential response to marketing activities
  - Consumer perceptions of the particular category (degree of perceived quality variations, level of perceived risks, and perceived value for money)
  - Differences in consumer needs
  - Different product importance among consumers
  - Price attitude

Context for proposed model

As mentioned earlier, Indian retail scenario is undergoing a vast change with a number of players getting into organized retailing. The competition is likely to be intense with foreign players planning to setup shop in India once foreign direct investment (FDI) restrictions in organized retail are relaxed. Currently direct foreign investment in retail sector is only allowed in Cash-And-Carry format and established foreign players like Metro and Carrefour have already started operations in India. Some more foreign players like Wal-Mart and Tesco have also ventured into India in collaboration with Indian partners. Even in nascent market, there has been rising competition, forcing many players to resort to adoption of private label brands to increase store loyalty and to improve the margins.

The country's leading retailers, Future Group, Aditya Birla Retail, and Reliance Retail are equally ambitious about their private label brands across food and non-food and are actively pursuing it. Apart from launching a slew of new products, the retailers are stepping up in-house promotional activities around private labels. Among the different product categories, food still continues to constitute major share of shopping basket for Indian consumers. In 2005, food constituted 49% of total expenses for Indian consumers according to National Council of Applied Economic Research data. In order to attract price-sensitive Indian consumers with promise of significant saving, all major retailers have focused on introducing private label brands in this category.

Future Group, India's leading retailer, has private labels brands like Tasty Treat (food, snacks, cola and soft drinks), Premium Harvest (packaged pulses and rice), Fresh & Pure (food and staples), Clean Mate (homecare), and Care Mate (personal care products) in its stores. According to data from the Future Group, private label brands contribute around 25% to the overall revenues generated from the FMCG business (The Economic Times, 17 November, 2009). In the potato chips category, which is dominated by brands such as Frito lay, Future Group's Tasty Treats has registered second place with an in-store share of 22%, falling back by a small margin (The Economic Times, 2 May, 2009). In the ready-to-eat snacks category, driven by brands such as Haldiram's, Tasty Treats has become a top seller at the group's Food Bazaar outlets with a 21% in-store share (The Economic Times, 2 May, 2009). The Tasty Treats brand of cereals, which was introduced after fallout with Kellog's, has been able to capture 18% market share (in Future Group's stores) for cereals (The Economic Times, 9 November, 2010). The company has lined up a series of brands to make an entry into new categories such as organic and ethnic foods. As part of this initiative, Future Group recently launched a differentiated community food brand, Ektaa, to retail staples and foods category based on cultural and geographical considerations. It plans to bring local products such as wheat, cereals, *papad*, *poha* and *rava* to the Ektaa brand over the next year.

Future Group has successfully introduced private label brands in non-food categories as well. The company's Care Mate diaper brand has clocked a share of about 41% in a category known to be built by brands such as Huggies (The Economic Times, 2 May, 2009). In the toilet cleaner segment, Future Group's Clean Mate brand is now neck-to-neck in market share with Harpic (who is leader in India with 75 % market share) across its Big Bazaar stores (The Economic Times, 6 September, 2010). On order to build upon,

the group has forayed into oral care with 'Sachs', a brand jointly developed with Sachin Tendulkar, world's leading cricketer.

Reliance Retail's private label food brands - Reliance Select, Reliance Value, Healthy Life, Good Life and Dairy Pure - contribute over 25% of the total food sales from its outlets (The Economic Times, 24 December, 2009). Reliance Fresh has opted for a strategy similar to British retailer Tesco by having private labels at two price points — one above the rest of the brands and one below — for a number of categories. In fact, the private labels — Reliance Value and Reliance Select — have even borrowed their names from Tesco's private labels. Significantly, Reliance Fresh also has private labels in staples and sugar, where there are virtually no brands. For its Dairy Pure brand, Reliance Retail is attracting customers by offering 10 % extra milk in every packet than that of its rivals for the same price. The company has launched private label brands in non-food category with introduction of floor cleaning products under the Expelz label.

Another major retailer, More, retail arm of Aditya Birla Group offers over 300 private label SKUs with brands such as Feasters noodles, Kitchen's Promise pickles, Fresh-O-Dent toothbrushes across 34-35 categories. These brands contribute six % of share of category in More stores and has 18% penetration with `Club More' loyal customers (The Economic Times, 2 December, 2009). More's private label brands are cheaper than the other brands in the space and offer 8-10% incremental margin over national brands. Also, many of these brands contribute more than the share of national brands present in More stores. For example, Feaster Noodles outsells iconic instant noodles brand Maggie across many zones.

The retailers are pursuing different strategies for apparel segment as far as percentage share of private label brands in their stores is concerned. For some players like Trent and Globus, the business is entirely driven by its private label. Trent, from the Tatas, has developed a business model purely on private labels in apparel under the Westside brand. Similarly, Globus - a multibrand retail chain, became a single store label brand under its own name. On the other hand, there are others like Shoppers' Stop which believe in capping the percentage of private labels in apparel in spite of being one of the pioneers of private label concept in India. Currently, 20 percent of apparel section at Shoppers Stop constitute of private labels. Other players like Future group and Reliance Retail have a mix of private label and national brands. Reliance Retail sells 14 private label brands

through its stores, which contribute almost 50% to its annual revenues in apparel category (The Economic Times, 16 September, 2010). The leading retailer Future group sports nearly 20 private label brands in apparel segment which contribute significantly to its profitability. Bharti Retail has also introduced Wal-Mart's top-selling apparel private label - George in its stores.

The growth of private label brands is not only limited to grocery and apparel segment but has proliferated to electronics items also. Future Group sells durable private label brands such as Koryo and Sensei for a number of products categories across multiple formats like eZone and Big Bazaar. Tata group company Infiniti Retail, which runs Croma stores in India, has started selling products like microwave ovens, refrigerators, and even laptops under its Croma retail brand in 2008. Now it has over 100 consumer electronic products under its portfolio ranging from accessories like head phones, pen-drives to high-end products like LCD, and plasma screen TVs. Croma's private label brands scores in innovative products like backseat massagers and jewellery cleaners - where big name brands are not present.

However, all the initiatives for private labels brands in electronics category have not been successful and some big retailers are pulling out their private labels or delaying launches in home appliances and electronics space, failing to repeat their success in apparel, food and personal care segments. Spencer's Retail is withdrawing its durable private brand 'Gerat', while Future Group is rationalising its product mix by pulling out of segments like headphones and computer peripherals.

Some of the players, realizing that electronic durables require after-sales service and brand-building support, do not want to enter or are going slow with electronics private label brand. Reliance Retail has decided not to venture into durable private labels due to high associated costs and long gestation period. Aditya Birla group's More wants to test the waters with small home appliances such as mixer & grinder, toasters and iron, before moving to the bigger products. The mobile store, retailer of mobile phones and accessories - promoted by Essar group, has decided to postpone launching its private label brand Ray.

However, organized retail, being a relatively new industry, players are still to understand the dynamics involved in decision making behavior of Indian customers. The conceptual

foundations developed so far had focused on American and European customers where large scale retail is fairly well established. With a dearth of studies pertaining to Indian retail scenario, this paper proposes to provide a structure for study of consumer behavior for private label brands in Indian context.

Though the private label brands have started appearing in a number of categories, it becomes important to examine consumer proneness for private label brands in Indian context. This study proposes to examine the consumer behaviour in apparel category for a number of reasons. The studies conducted for private brand proneness have suffered from data collection problem as the data collection had been mostly through self-report measures which may turn out to be biased. It is advised that behavioral measures collected from sales data is often a better measure (Richardson et. al., 1996). Though the scanner panel data is sparingly available in India, the loyalty programs of apparel retail stores like Shopper's Stop, Future Group, and Trent capture a lot of data about the consumers and can provide data for the study. Secondly, the apparel retail stores house a number of brands of competitors apart from store brands, thus providing a situation where consumer make choices between private labels and national brands. This situation reflects more accurately the shopping behavior of the consumer in comparison to the situation where consumer does not get a choice of different categories of brands. This is unlike the situation in grocery markets where consumers are generally given choice of only store brand for grocery products.

Mathematical formulation of model

The purchasing behavior of consumer for private label brand proneness can be modeled using discrete choice models. The discrete choice models (DCM) can be related to utility theory (UT) as utility theory provides a context for motivating and deriving various specifications of function to be employed (Train, 1985; McFadden, 1986). Here the dependent variable y relates to the actual purchases made by each individual customer and it is coded 1 for private label brand purchase and 0 for national brand purchase.

The derivation of QCM from UT is based on a precise distinction between the behavior of the decision-maker i.e. the consumer and the analysis of the researcher. First, we consider the decision-maker. Consumer **n** has a choice among the alternatives in set $\boldsymbol{J_n}$. Designate the utility from alternative $\boldsymbol{i}$ in $\boldsymbol{J_n}$ as $\boldsymbol{U_{in}}$. As there are only two alternatives presented here

i.e. private label brands and national brands, they can be labeled as U_{in} as utility from private label brands and U_{jn} as utility from national brands.

One can label the vector of all relevant characteristics of alternative ***i*** as faced by person ***n*** as x_{in} and the vector of all relevant characteristics of person ***n*** as r_n. Since x_{in} and r_n include all relevant factors, we can write utility of private label brand as a function of these factors,

$U_{in} = U(x_{in}, r_n)$ where U is a function

The consumer chooses alternative ***i*** (i.e. choice of private label brand) in J_n if and only if $U_{in} > U_{jn}$.

Thus, ***n*** chooses ***i*** in J_n, iff $U(x_{in}, r_n) > U(x_{jn}, r_n)$, **…(I)**

Here we assume that the consumer choice is deterministic (Train, 1985) as he chooses the alternative that provides the highest utility. If one were to define, at this point, the probability that person **n** would choose alternative **i**, then the probability would necessarily be either one or zero depending on whether or not alternative i provided the greatest utility.

Now, in order to specify the choice probabilities, we focus on the researcher. Suppose that a researcher is interested in predicting this consumer's choice. If the researcher observed all the relevant factors i.e. x_{in} and x_{jn} for ***i*** and ***j*** in J_n and r_n, and knew the decision-maker's utility function U, then the researcher could use the above relation to perfectly to predict the decision-maker's choice. However, the researcher does not observe all the relevant factors and does not know the utility function exactly.

The solution to the problem lies in partitioning the elements of x_{in} into two sub-vectors: those characteristics of the alternative that are observed by the researcher, denoted by vector z_{in}, and those that are not (not labeled). Similarly, partition r_n into observed characteristics of the person, labeled s_n, and characteristics that are not observed by the researcher. Finally decomposing $U(x_{in}, r_n)$ for ***i*** and ***j*** in J_n into two subfunctions, one that depends only on factors that the researcher observes and whose form is known by the researcher up to a vector of parameters, β, to be estimated, with this component labeled $V(z_{in}, s_n, \beta)$, and another that represents all factors and aspects of utility that are unknown by the researcher, which is labeled e_{in}. That is, utility of private label brand

$$U_{in} = U(x_{in}, r_n) = V(z_{in}, s_n, \beta) + e_{in} \quad \text{…(II)}$$

The choice probabilities can be defined as the probability that person n chooses alternative ***i***, denoted by P_{in}, is the limit of the proportion of times, as the number of times increases without bound, that the researcher would observe a decision-maker who faces the same alternative as person ***n***, and with the same values of observed utility for each alternative, to choose alternative ***i***. (Note that this probability is defined on the researcher, reflecting the researcher's lack of information regarding all factors affecting the decision-maker's choice.)

Expressing the equation (I) in terms of probability,

$$P_{in} = \text{Prob}(U_{in} > U_{jn} \text{ for all } j \text{ in } J_n, j \neq i)$$

By putting equation (II) in above equation and letting V_{in} denoting $V(z_{in}, s_n, \beta)$ for notational simplicity, we get

$$P_{in} = \text{Prob}(V_{in} + e_{in} > V_{jn} + e_{jn} \text{ for all } j \text{ in } J_n, j \neq i)$$

Rearranging, we get

$$P_{in} = \text{Prob}(e_{jn} - e_{in} < V_{in} - V_{jn}, \text{ for all } j \text{ in } J_n, j \neq i) \quad \text{…(III)}$$

By knowing the distribution of random ***e's*** (though not knowing their particular values), the researcher can derive the distribution of each difference $e_{jn} - e_{in}$ and using equation III, can calculate the probability that the decision-maker will choose alternative ***i*** as a function of $V_{in} - V_{jn}$. Here the point to note is that **V** is a deterministic component made of a function of measured explanatory variables such as characteristics of the alternative that are observed and observed characteristics of the consumer. Similarly ***e*** is the random component that reflects omitted choice determinants. Let $e = e_{jn} - e_{in}$ and $\mathbf{V} = V_{in} - V_{jn}$, then we may define a latent continuous variable $\mathbf{Y} = \mathbf{V} + \mathbf{e}$ and we can write

$$P_{in} = P(1) = P(Y>0) = P(e > -V)$$

Letting ***f(e)*** and ***F(e)*** be the density function and cumulative density function of ***e*** respectively, we get $P(1) = 1 - F(-V)$ (Baltas & Doyle, 1998) as the value of cumulative density function of ***e*** at ***V***.

A specific qualitative choice model can be obtained by specifying some distribution for the unknown component of utility and deriving functions for the choice probabilities. We may specify any density function for the random variable of this behavioral model. In

practice, only two densities are used (Baltas & Doyle, 1998). The first is normal distribution which yields a binary probit model and the second one is the logistic distribution which yields a binary logit model.

This paper proposes density function for the random variable to be logistic distribution. The shapes of the logistic and normal distribution are quite similar and as long as proportions are not extreme, the results of the two analysis are very similar. However, the assumption that the underlying distribution is normal makes probit analysis a bit restrictive than logit analysis (Gujarati, 2004). Thus, logit analysis is considered better than probit analysis if there are too many cases with very high or low probabilities. For the same, logit analysis (either binomial or multinomial) has been used extensively by researchers for model specification (Guadagni & Little, 1983; Kamakura & Russell, 1989).

As we defined earlier, our dependent variable **y** relates to the actual purchases made by each individual customer and it is coded 1 for private label brand purchase and 0 for national brand purchase. The probability of **y** had been decomposed into two parts namely **V**, which can be measured and **e** which is the error term and can not be measured. Therefore the probability that a consumer **n** buys private label in purchase occasion **t** is

$$P(y_{nt} = 1) = P(V_{it} + e_{it} > 0) = P(\beta x_{it} + e_{it} > 0)$$

where x_{it} is the vector of explanatory variables and β is the vector of respective parameters. The explanatory variables will be demographic and psychographic variables which have been listed after literature review. On the other hand, e_{it} will comprise of unobserved and thus unmeasured variation in preferences. It is important to note that e_{it} consists of both inter-individual and intra-individual preferences. Even if there are no differences among consumers and they are identical in terms of preferences, a consumer can have inter-individual differences spread across time.

Thus, we can summarize the model which can be empirically testable. For the ***n***th customer, the probability of purchase of private label brand can be expressed as:

$$P(y_{nt} = 1) = \exp(\beta x_{nit} + e_{nit}) / [\exp(\beta x_{nit} + e_{nit}) + \exp(\beta x_{njt} + e_{njt})]$$

where x_{nit} is the vector of explanatory variables and β is the vector of respective parameters. This expression βx_{nit} after incorporating all the explanatory variables can be further expanded as following:

$\beta x_{nit} = \beta_1$ age + β_2 education + β_3 income + β_4 family size +

β_5Purchasing experience + β_6Response to marketing activities +

β_7Perceived quality variations + β_8Level of perceived risks +

β_9Perceived value for money + β_{10}Differences in consumer needs **…(IV)**

Data collection and operationalization of variables

As mentioned earlier, one of the reasons for choice of apparel stores was due to ease of data collection from loyalty programs. For example, Shopper's Stop has 1.8 million loyalty card holders who account for 73 percent of the total sale (Business Standard, 10 January, 2011) and this data can be used for analysis. The variables mentioned in the equation (**IV**) can be operationalized in following way.

The demographic data regarding age, education, income, and family size can be taken up from the basic information collected when membership details are fixed. The information about age, education and income can be taken in name of the loyalty card holder (either male or female) and family size will be number of people staying together in a household.

Regarding the "private brand purchasing experience", one can number the trips made to the store and same can be taken to stand for purchase experience. However, there may be cases when customer may visit the store and may not make any purchases. Thus, a measurable but probably less accurate measure of this variable will be no of purchase trips made (either private label brands or national brands) by the consumer. The data pertaining to "response to marketing activities" can be collected from details of purchases made during marketing promotions schemes. "Perceived quality variation" can be measured by variation in prices of products purchased for a product category. In case the prices vary beyond a limit, then it can be said that consumers are able to discern between the quality and are willing to pay differential prices for different brands in same product category. The "level of perceived risk" can be classified as high or low with high corresponding to purchase of only one category of brands (either private label or national) and low corresponding to situation when customer may purchase a mix of both category of brands.

The "perceived value of money" can be coded as 1 and 0 with 1 signifying value for money in case customer purchases only the cheapest brands. "Difference in customer

need" may be difficult to measure but a workable operationalization can be number of different product category that customer purchases, implying that a customer buying higher number of product category items will have diverse needs.

Conclusion

The model proposed in the paper was an attempt to include demographic and psychographic variables in a single model to understand the customer proneness to private label brands. Though, the approach had been to make the model most comprehensive, it still lacks inclusion of many environmental variables. Moreover, the study focuses on only one category and does not include other product categories. Furthermore, more work needs to be done in operationalization of variables for data collection.

The choice of apparel stores for context of study poses certain challenges as well. Firstly, the loyalty programs in apparel category are taken up by high-worth individuals who make regular purchases and thus, the data will not be representative of the populations. Moreover, while proposing the logit model for data analysis, we are assuming that choices among private label brand and national brand are independent of one another. In reality, it may not be so and thus one may have to resort to nested logit.

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