Performance of Store Brands: A Cross-Country Analysis of Consumer Store Brand Preferences, Perceptions, and Risk

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Abstract

This paper empirically studies consumer choice behavior in regard to store brands in the US, UK and Spain. Store brand market shares differ by country and they are usually much higher in Europe than in the US. However, there is surprisingly little work in marketing that empirically studies the reasons that underlie higher market shares associated with store brands in Europe over the US.

In this paper, we empirically study the notion that the differential success of store brands in the US versus in Europe is the higher brand equity that store brands command in Europe over the US. We use a framework based on previous work to conduct our analysis: consumer brand choice under uncertainty, and brands as signals of product positions. More specifically, we examine whether uncertainty about quality (or, the positioning of the brand in the product space), perceived quality of store brands versus national brands, consistency in store brand offerings over time, as well as consumer attitudes towards risk, quality and price underlie the differential success of store brands at least partially in the US versus Europe. We propose and estimate a model that explicitly incorporates the impact of uncertainty on consumer behavior. We compare 1) levels of uncertainty associated with store brands versus national brands, 2) consistency in product positions over time for both national and store brands, 3) relative quality levels of national versus store brands, and 4) consumer sensitivity to price, quality and risk across the three countries we study.

The model is estimated on scanner panel data on detergent in the US, UK and Spanish markets, and on toilet paper and margarine in the US and Spain. We find that consumer learning and perceived risk (and the associated brand equity), as well as consumer attitude towards risk, quality and price, play an important role in consumers' store versus national brand choices and contribute to the differences in relative success of store brands across the countries we study.

Key Words: Store brands, brand choice, learning, perceived risk, international marketing

Introduction

Store brands, or private labels, are owned, controlled, and sold exclusively by retailers. Store brands have been gaining an increasing share of the market in most consumer product categories. The trend towards higher store concentration, global recession and changing consumer habits also influence the growth of store brands.

Nevertheless, the market shares of store brands vary by product class and across countries. For example, in the grocery industry, store brands in Germany have more than doubled their share of the market in four years, while growth of store brands in the US seems to have stopped (Nielsen, 1994). This trend results in an uneven penetration of store brands by country: 45 percent share in Switzerland, 37 percent in the U.K., 22 percent in Canada and 12 percent share in the US (Dhar and Hoch 1997). Differences in market concentration, store brand positioning and consumer price sensitivity are responsible for this phenomenon (Bell, Davies and Howard 1997, Blattberg, Eppen and Lieberman 1978). Nevertheless, there has been surprisingly little empirical work done in marketing to study the reasons that underlie the relative strength of store brands in Europe *vis a vis* the US.

The purpose of this paper is to empirically study the notion that the differential success of store brands in Europe *vis a vis* the US may be partially explained by the higher brand equity that European store brands command than the store brands in the US. Indeed, Erdem et. al. (1999) indicate that the relative success of store brands in Europe may be partially explained by store brands commanding higher equity in Europe than in US and call for future research in this area. In this paper, we examine whether consumer

uncertainty about store brands, perceived quality (or perceived positioning) of store brands, consistency in store brand offerings over time, as well as consumer attitudes towards price, quality and risk, underlie the differential success of store brands in US versus Europe at least partially.

We draw upon previous literature on brand equity and consumer choice under uncertainty to build the framework for our study. Based on signaling theory in economics (Spence 1974, Tirole 1990), Erdem and Swait (1998) developed an information economics based approach to brand equity. They associated the added values that brands endow products (Farquhar 1989) with the value of brands as signals of products' positions under consumer uncertainty and asymmetric information. In particular, they suggest that the credibility of a brand is crucial in brands' ability to signal product positions. They also suggest that consistency in brand positions over time, including consistency in the attribute (e.g., quality) levels of products, increases the credibility of a brand as a signal of a product's position, which may decrease perceived risk (variance of consumer quality perceptions), information costs, as well as increase perceived quality (mean of consumer quality perceptions) associated with a brand. The key point is that in this view added values associated with brands, brand equity, are mainly driven by consistency and credibility, and not necessarily by perceived quality.[1] Indeed, the importance of consistency and credibility in every aspect of brand strategy has been

[1] Although higher perceived quality will lead to higher brand equity, *ceteris paribus*, high perceived quality is not a necessary condition for high brand equity. For example, K-Mart is not associated with "high quality", yet it commands high brand equity due to its consistent and credible positioning that it provides good value, which decreases consumer perceived risk (variance of consumer quality beliefs).

emphasized in previous managerial literature as well (e.g., Aaker 1991). Finally, Erdem (1998) estimates a structural model of brand choice under uncertainty about quality (or any imperfectly observable product attribute[2]) to test the consumer behavior implications of using umbrella branding to signal the quality of a new experience good (Wernerfelt 1988).

We estimate a similar model that explicitly incorporates the impact of uncertainty on consumer behavior. In our model, consumers have uncertainty about quality levels (positioning of the brand in the product space) and have priors about quality. They learn about quality levels over time through use experience and update their quality perceptions upon experience with the product. Consistency in quality levels over time assures that use experience information is less noisy, which decreases consumer perceived risk (variance of consumer quality beliefs). We estimate the model on scanner panel data on detergent (toilet paper and margarine) from three countries (two countries), namely US, UK and Spain (US and Spain). Across the countries we study, we compare 1) levels of uncertainty associated with store brands versus national brands, 2) consistency in product positions (quality) over time, 3) relative quality level of national versus store brands, 4) consumer sensitivity to price, quality, and risk. Also, the proposed model allows consumers to be heterogeneous in their quality perception, tastes, price sensitivities and risk behavior.

[2] In the literature on brand signaling (as well as on consumer brand choice under uncertainty), quality (or perceived quality) is interpreted as a "summary statistic" that captures any intangible and tangible attributes of a product, which may be imperfectly observable by consumers (please see for a review Erdem and Swait 1998).

We find strong empirical support that consumer uncertainty about quality (or any other imperfectly observable attribute), consumer learning and perceived risk play an important role in consumer's store versus national brand choices and contribute to the differences in relative success of store brands across the countries we study. We also find that consumer attitudes towards risk, price and quality explain partially differential market shares of store brands in frequently purchased packaged goods in the US versus Europe.

The rest of the paper is organized as follows. Next section provides a theoretical framework for the empirical analysis. Then, we describe the model and the estimation procedure. We follow with a discussion of the data and the empirical results and conclude with implications for future research.

Consumer Learning and Perceived Risk

Both psychologists (Fishbein, 1967) and economists (Lancaster, 1966) suggest that consumers see products as having several attributes. Consumers view a particular product in terms of where it lies between the set of attributes relevant to its product class. Consumers are likely to develop perceptions about where different brands stand on each attribute.

Consumers may be imperfectly informed and hence uncertain about product attribute levels such as the quality level of a product. Product "quality" seems to be the attribute that consumers are usually uncertain about, according to research in information economics. Like in previous research (e.g., Aaker 1991, Erdem 1998), we use the term "quality" to reflect any intangible or tangible product attributes (which may not be perfectly observable by consumers). This uncertainty may persist even after experience

with a product because use experience may provide only noisy information. Thus, consumer perceptions of quality levels may deviate from true levels (Erdem and Keane 1996). Furthermore, there may be "inherent product variability", that is, the quality levels of different units of the same product may differ over time (Roberts and Urban 1988), adding to consumer uncertainty.

Prior Uncertainty

When there is consumer uncertainty, consumers may develop prior expectations about product quality. These prior expectations may be more precise (subject to less variance) for brands, which have had consistent communications strategies over time and as a result have more consistent brand positions in the attribute space. Although prior uncertainty may be higher for store brands than national brands, the difference in prior uncertainties associated with store versus national brands may be less in Europe than in US due to more consistent communication strategies of store brands in Europe. This may be one of the reasons that underlies the relative success of store brands in Europe.

Precision of Information Contained in Use Experience

As consumers experience these products, their perceptions of product quality may change. Consumers learn about different brands via their experiences with the brands (Erdem 1998). Thus, if a product delivers consistent attribute levels over time, then use experience will provide more precise information about product attribute levels, which would decrease consumer perceived risk (variance of attribute level beliefs or variance of quality beliefs) more than in the case where use experience provides more noisy information due to (real or perceived) inconsistent attribute levels over time. Thus, consistency in quality over time will lead to lower levels of perceived risk, *ceteris*

paribus, which would lead to higher brand equity, *ceteris paribus* (Erdem and Swait 1998). Hence, one of the underlying reasons that the store brands in Europe have higher market shares than store brands in the US may be that the European store brands deliver more consistent quality levels to consumers compared to store brands in the US; this would reduce consumers' perceived risk and increase risk-averse consumers' expected utility associated with store brands more than it is the case in the US. Indeed, the literature on cross-category differences in store brand market shares speculates that store brand shares are likely to be higher in categories with low perceived consumer risk and lower quality variability (Batra and Sinha, 2000).

Consumer Sensitivity to Price, Quality and Risk

Other consumer related mechanisms that may underlie such differences include the possibility of consumers' relative sensitivity to price might be higher in Europe than in the US, and their relative sensitivity to quality and risk might be lower in Europe than in the US, which may also partially explain the relative success of store brands in Europe versus the US.

Quality Differentials between National and Store Brands

Finally, although the perceived or expected levels of quality for national brands may be higher than that of store brands in both Europe and the US, the relative differences in perceived quality levels between national and store brands may be lower in Europe than the US. Indeed, although most consumers may choose store brands because of the price advantage, high quality seems to be more important in determining store brand success over a lower price (Sethuraman, 1992).

In this paper, we develop and estimate a model, which, for the first time in the literature, explicitly accounts for the factors that were discussed above and that may underlie differences in market shares in given categories across the US and Europe.

The Model

Consider a market where there are a set of consumers $I = \{i|i = 1, 2, ..., I\}$. Let $J = \{j|j = 1, 2, ..., J\}$ be the set of brands that includes both national brands and store brands in the market. The purchases of the consumers are observed over the period $T = \{t|t = 1, 2, ..., T\}$, where T is the time span of the period.

Consumers may be imperfectly informed and hence uncertain about product quality. Research in information economics usually refers to the overall "quality" of a product as the product attribute that consumers are uncertain about. We once again emphasize that we use this term as a summary statistic that reflects both tangible and intangible attributes of a product, as it has been the case in the previous literature on brand choice under uncertainty (e.g., Erdem, 1998). Thus, we define

$$X_{ijnt} = A_{j_n} + x_{ijnt}, \quad (1)$$

$$X_{ijst} = A_{j_s} + x_{ijst}, \quad (2)$$

where X_{ijnt} is the overall quality level of a national brand j_n that consumer i would have perceived at time t, had consumer i purchased the brand at time t. A_{j_n} is the (true)[3] mean quality level for national brand j_n and x_{j_nit} is an i.i.d. random error term[4]. x_{ijnt} may reflect

[3] True mean quality here does not have a one-to-one correspondence to an objective level since some of the "quality" dimensions would be intangibles for which objective levels may not even exist. We estimate "*A*"s as parameters of the model to reflect mean quality perceptions (please see Ackerberg 2000, Erdem and Keane 1996 for details).

[4] Note that A's are imperfectly observable from the consumers' point of view and they are "latent" variables to the analyst.

not only the possibility that a consumer may randomly get a "lemon" or "windfall", but also a consumer's inability to perfectly evaluate the quality level. X_{ijst}, A_{js}, and x_{ijst} are the respective overall quality level, mean quality level, and the random error term for the store brands. In summary, the above equations tell us that experience with a brand provides imperfect information about the true product quality of that brand.

It is assumed that consumers learn about the means of quality levels of national brand and store brand A_{jn}, A_{js} through Bayesian updating. Previous literature suggests that the Bayesian updating mechanism often provides a reasonable fit to observed choice behavior (Roberts and Urban 1988, Erdem and Keane 1996, Erdem 1998). It is assumed that consumers' priors on the quality levels A_{jn} and A_{js} are normally distributed at time $t = 0$

$$A_{jn} \sim N\left(\overline{A}_{jn}, \sigma^2_{An}\right) \tag{3}$$

$$A_{js} \sim N\left(\overline{A}_{js}, \sigma^2_{As}\right) \tag{4}$$

Here $\overline{A}_{jn}$ is the prior mean perceived quality levels for national brand j_n such that $E_{0i}\left[A_{jn}\right] = \overline{A}_{jn}$ for each consumer. σ^2_{An} is the prior variance of the quality level of national brand as perceived by consumer i at $t = 0$. The prior mean perceived quality levels and the prior variance of the quality level of store brands are denoted by $\overline{A}_{js}$ and σ^2_{As}. x_{ijnt} and x_{ijst}, $i = 1, 2, ..., I$, $j = 1, 2, ..., J$, $t = 1, 2, ..., T$, is assumed to be normally distributed. σ^2_{An} and σ^2_{As} capture consumers' initial uncertainty with the national and store brands, respectively (initial or prior variance of their perceived quality levels). We should note that in previous work on brand choice under uncertainty, all brands were assumed to have the

same prior variance so this is the first work allowing brands (in particular, store versus national brands) to have different prior variances.

The random error terms associated with consumer latent attribute (quality) perceptions are distributed as

$$x_{ijnt} \sim N\left(0, \sigma_{xn}^2\right) \tag{5}$$

$$x_{ijst} \sim N\left(0, \sigma_{xs}^2\right) \tag{6}$$

where σ_{xn}^2 is the experience variability for national brands, and σ_{xs}^2 is the experience variability for store brands. It is assumed in this paper that x_{ijnt} is i.i.d. across consumers, national brands and time period, and that x_{ijst} is i.i.d. across consumers, store brands and time periods. These experience variabilities capture the noisiness of information contained in use experience ($1/\sigma_x^2$ is the precision of information contained in a signal in Bayesian updating). The higher these variabilities are the less diagnostic each use experience is to resolve uncertainty about quality levels either due to inherent true product variability (true quality levels fluctuating around a mean over time) or inability of consumers to assess the true quality levels (for example, perceived inconsistency in consumed quality levels due to situational factors).[5] One may expect that $\sigma_{xn}^2 < \sigma_{xs}^2$ since national brands may achieve higher quality standardization.

Since consumers behave as Bayesian updaters, their expectations of the latent attribute levels (e.g., quality) can be described as:

[5] There may be several reasons why consumer experiences may provide only imperfect information: it may take a long time to learn about product characteristics (e.g., a consumer may realize that a particular brand of detergent takes the color off the laundry after several months of usage); the experience may be also context dependent (e.g., a consumer may not observe that the detergent does not remove a particular stain till after such a stain is present in the consumer's laundry).

$$E_{it}\left[A_{j_n}\right] = A_{j_n} + z_{ijnt}, \qquad z_{ijnt} \sim N\left(0, \sigma^2_{A_{ijnt}}\right) \tag{7}$$

$$E_{it}\left[A_{j_s}\right] = A_{j_s} + z_{ijst}, \qquad z_{ijst} \sim N\left(0, \sigma^2_{A_{ijst}}\right) \tag{8}$$

Here, z_{ijnt} denotes consumer *i*'s expectation errors at time *t* for national brand j_n, and $\sigma^2_{A_{ijnt}} = E\left[\left(A_{j_n} - E_{ti}\left[A_{j_n}\right]\right)^2\right]$. $\sigma^2_{A_{ijnt}}$ is the variance of consumer *i*'s expectation errors associated with brand j_n at time *t* as perceived by consumer *i*. This basically reflects the variance of consumer quality (or imperfectly observable attribute) beliefs and this represents perceived risk to consumers. z_{ijst} and $\sigma^2_{A_{ijst}}$ are consumers' expectation errors associated with store brand j_s and the variance of expectation errors associated with store brand j_s, respectively.

At time *t*, consumer *i* updates her expectation of the mean of the quality level A_{j_n} and A_{j_s} using the received information contained in surprise elements of the experience with brand j_n and j_s.

Thus, according to the Bayesian rule,

$$E_{tl}\left[A_{j_n}\right] = E_{t-1,i}\left[A_{j_n}\right] + \sum_{j_n=1}^{J_n} D_{ijnt}\beta_{ijnt}\left(X_{ijnt} - E_{t-1,i}\left[X_{ijnt}\right]\right) \tag{9}$$

$$E_{tl}\left[A_{j_s}\right] = E_{t-1,i}\left[A_{j_s}\right] + \sum_{j_s=1}^{J_s} D_{ijst}\beta_{ijst}\left(X_{ijst} - E_{t-1,i}\left[X_{ijst}\right]\right) \tag{10}$$

where variable D_{ijnt} equals one if a consumer *i* purchases national brand j_n at *t*, and is zero otherwise. D_{ijst} equals one if a consumer purchases store brand j_s at *t*, and is zero otherwise. Note in the above equations, it is assumed that a consumer updates her quality perception of a national brand j_n every time she buys a national brand from the set J_n.

Likewise, a consumer will update her quality perception for a store brand j_s each time when she buys a store brand from the set J_s.

The β 's are Kalman gain coefficients obtained from employing the Kalman filtering algorithm.

$$\beta_{ijnt} = \frac{\sigma^2_{Aijnt}}{\sigma^2_{Aijnt} + \sigma^2_{xn}} \tag{11}$$

$$\beta_{ijst} = \frac{\sigma^2_{Aijst}}{\sigma^2_{Aijst} + \sigma^2_{xs}} \tag{12}$$

β_{ijnt} is the weight attached to the information from past purchase of national brand j_n by consumer *i* when she evaluates the quality level of brand j_n at time *t*. And β_{ijst} is the weight attached to the information from usage experience of store brand j_s by consumer *i* when she evaluates the quality level of brand j_s at time *t*.

Consumer *i* also updates the variance σ^2_{Aijnt} and σ^2_{Aijst} of the quality levels for national brand j_n and store brand j_s at time *t*.

$$\sigma^2_{Aijnt} = (1 - \beta_{ijnt})\sigma^2_{Aijnt-1} \tag{13}$$

$$\sigma^2_{Aij_st} = (1 - \beta_{ijst})\sigma^2_{Aij_st-1} \tag{14}$$

Note that these variances capture consumer perceived risk (since quality beliefs have a variance) and given (13) and (14) and (11)-(12), these variances would be lower, 1) the lower the prior uncertainty is, that is, the lower the prior variances of quality beliefs (σ^2_{An} and σ^2_{As}) are, 2) the more diagnostic or precise the use experience information is (that is, the smaller the experience variabilities σ^2_{xn} and σ^2_{xs} are).

We should also make several remarks here. First, both perceived quality and perceived risk have been proposed in the literature as components of brand equity (Aaker 1991, Erdem and Swait 1998). In our model, we label the "*A*"s as mean (perceived) quality levels and "σ_A^2" as perceived risk (variance of quality beliefs) (Erdem and Keane 1996, Erdem 1998).

In this paper, we follow the tradition of the internal structure of market analysis literature (e.g., Elrod 1988, Elrod and Keane 1995, Erdem 1998) that imposes a factor analytic structure on the brand specific constants and decomposes the brand specific constants commonly estimated in brand choice models into attribute locations (A) and weights attached to them (w). The *A*s in our model represent latent attribute locations for each brand. In other words, they capture the positioning of the brand in the product space.

The literature on internal analysis of market structure refers to these *A*s as "latent" since they are unobservable by the analyst. These *A*s have been referred to just as latent "attributes" (e.g., Elrod 1998, Erdem and Keane 1996), when two latent attributes (common factors) were estimated, leading to two-dimensional market maps. These *A*s have been referred to as "perceived quality", when one latent attribute (common factor) was estimated, leading to a one-dimensional map (e.g., Erdem 1998), where the term "quality" was used as a summary statistic of various intangible and tangible brand attributes, as it is the case in this paper. As in Erdem (1998), we label these *A*s as (mean) perceived quality as well.

Finally, "σ_A^2" refers to the variance of quality beliefs of the individual consumer. If a given consumer's quality beliefs would have a variance of zero, that would imply that the consumer has no uncertainty about quality levels and hence, no perceived risk.

In our modeling framework, consumer perceived risk as captured in equations (13) and (14), as well as expected attribute (or quality) levels as captured in equations (9) and (10), constitute "brand equity." Thus, brands with higher equity will have lower perceived risk (lower variance of consumer quality beliefs) and/or higher expected attribute levels (higher mean quality beliefs or perceptions), *ceteris paribus*. Second, we should note that in a reduced-form modeling setting, the brand specific constants, which have often been labeled as brand equity terms (Kamakura and Russell 1993), embed the effects captured in equations (9), (10), (13) and (14). We should also stress here that the purpose of this paper is not to provide a full measure of brand equity. Rather, we aim to test whether certain concepts that have been proposed and shown to be components of brand equity help to explain differential success of store brands in the US versus Europe.

Recall from equation (7) and (8) that z_{ijnt} and z_{ijst} denote the consumer perception errors at time *t* for brand j_n and brand j_s. Thus $z_{ijnt} = E_{ti}[A_{j_n}] - A_{j_n}$, $z_{ijst} = E_{ti}[A_{j_s}] - A_{j_s}$. Also, because x_{ijnt} and x_{ijst} have means of zero, we have $E_{t-1,i}[X_{ijnt}] = E_{t-1,i}[A_{j_n}]$, and $E_{t-1,i}[X_{ijst}] = E_{t-1,i}[A_{j_s}]$. With these, equations (9) and (10) can be written as

$$z_{ijnt} = z_{ijnt-1} + \sum_{j_n=1}^{J_n} D_{ijnt}\beta_{ijnt}\left(x_{ijnt} - z_{ijnt-1}\right) \tag{15}$$

$$z_{ijst} = z_{ijst-1} + \sum_{j_s=1}^{J_s} D_{ijst}\beta_{ijst}\left(x_{ijst} - z_{ijst-1}\right) \tag{16}$$

Expected Utilities

U_{ijt}, the utility of consumer *i* from purchasing brand *j* at time *t*, is assumed to depend on the perceived quality level X_{ijt} and price P_{ijt}. Here, *j* is from the whole choice set *J* that includes both national brands and store brands. Hence, in this section, we drop the subscripts *s* and *n* to denote store and national brands. What follows will be applicable to both. To capture uncertainty in product quality and attitudes towards risk, we need a flexible specification for U_{ijt} to allow for risk-averse, risk-neutral and risk-taking behaviors. Hence, we allow U_{ijt} to depend on X_{ijt} nonlinearly. One such nonlinear utility function that captures risk aversion/risk taking is the quadratic form (Bell, et. al. 1988):

$$U_{ijt} = \alpha_i P_{ijt} + \omega_i X_{ijt} + \omega_0 \gamma_i X_{ijt}^2 + \varepsilon_{ijt} \qquad (17)$$

where α_i and ω_i are the price sensitivity and utility weight of the perceived quality for consumer *i*, respectively, that are heterogeneous across consumers. ω_0 is the mean utility weight of the square of perceived quality levels. γ_i is the heterogeneous risk aversion coefficient. If $\omega_0 > 0$, then $\gamma_0 < 0$ would suggest risk aversion at the mean, where γ_0 is the mean of γ_i. If $\gamma_0 > 0$, this suggests risk-taking behavior at the mean and if $\gamma_0 = 0$, this suggests risk neutrality at the mean. ε_{ijt} is a time varying stochastic component of utility, which is assumed to be i.i.d. extreme value. ε_{ijt} captures random taste shocks known by the household and unobserved by the analyst. Note that the functional form of the utility specification has by definition implications for consumer risk behavior, as well as other consumer behavior phenomena. For example, if the empirical results show

evidence for diminishing marginal returns to quality (or the attribute in question), that is, for concavity, this would suggest risk aversion, as well as "attribute satiation" (since attribute satiation has been often defined as diminishing marginal returns to an attribute). We should, note however, that although concavity implies risk aversion by definition, concavity itself does not imply uncertainty. As it will be shown later in this Section, concavity only implies that if there is uncertainty, then expected utility will be decreasing in uncertainty.

To capture consumer unobserved heterogeneity in price sensitivities, utility weights, and risk aversion coefficients, we model unobserved heterogeneity as random effects and adopt the continuous approach (Allenby and Rossi 1999) and, hence, assume that

$$\alpha_i \sim N(\alpha_0, \sigma_\alpha),$$

$$\omega_i \sim N(\omega_0, \sigma_\omega),$$

$$\gamma_i \sim N(\gamma_0, \sigma_\gamma),$$

We can write the utility function as

$$U_{ijt} = V_{ijt} + \varepsilon_{ijt}, \tag{18}$$

where

$$V_{ijt} = \alpha_i P_{ijt} + \omega_i X_{ijt} + \omega_0 \gamma_i X_{ijt}^2 \tag{19}$$

Consumers form expectations about product quality, and, hence, about the utility they will derive by consuming a brand. Thus, the expected utility of consuming brand *j* at time *t* for consumer *i*, given the information consumer *i* has at time *t*, is

$$E_{ti}\left[U_{ijt}\right] = E_{ti}\left[V_{ijt}\right] + \varepsilon_{ijt} \tag{20}$$

By the definition of V_{ijt}, we can write

$$E_{ti}\left[V_{ijt}\right] = \alpha_i P_{ijt} + \omega_i E_{ti}\left[X_{ijt}\right] + \omega_0 \gamma_i E_{ti}\left[X_{ijt}^2\right] \tag{21}$$

The above equation can be rewritten as:

$$E_{ti}\left[V_{ijt}\right] = \alpha_i P_{ijt} + \omega_i E_{ti}\left[X_{ijt}\right] + \omega_0 \gamma_i E_{ti}\left[X_{ijt}\right]^2 + \omega_0 \gamma_i E_{ti}\left[\left(X_{ijt} - E_{ti}\left[X_{ijt}\right]\right)^2\right] \tag{22}$$

Following Erdem (1998), the above equation can again be rewritten as:

$$E_{ti}\left[V_{ijt}\right] = \alpha_i P_{ijt} + \omega_i \left(A_j + z_{ijt}\right) + \omega_0 \gamma_i \left(A_j + z_{ijt}\right)^2 + \omega_0 \gamma_i \left(\sigma_{Aijt}^2 + \sigma_{xj}^2\right) \tag{23}$$

where we will assume the experience variabilities, σ_{xj}^2, to be different for store versus national brands but we will estimate one experience variability for national brands and another one for store brands (in previous work, all experience variabilites have been assumed to be the same for all brands as in Erdem 1998).

The equation above suggests that the expected utility under risk aversion will be higher the more experience a consumer has with brand *j*, the more precise is the information gained through experience, and the lower the prior uncertainty associated with that brand, *ceteris paribus*. We would like also to note several points in regard to equations (22) and (23). First, given the functional form of the utility function, depending on the signs of parameters estimates of ω_0 and γ_0 (where γ_0 is the mean of γ_i), we stress that one may get risk averse, risk neutral or risk seeking behavior. Thus, we do not impose risk aversion *a priori*. If $\omega_0 > 0$ and $\gamma_0 < 0$, then we have a concave utility function that suggests diminishing marginal returns to quality, which also suggests that (please see Equation 22) expected utility is decreasing in the expectations over the squared deviations of quality levels from expected quality levels (i.e., $E_{ti}\left[\left(X_{ijt} - E_{ti}\left[X_{ijt}\right]\right)^2\right]$ (and variance of

quality beliefs ($\sigma^2_{A_{ijnt}} = E\left[\left(A_{j_n} - E_{ti}\left[A_{j_n}\right]\right)^2\right]$). Thus, with $\omega_0 > 0$ and $\gamma_0 < 0$, we get that consumers like to avoid any such deviations and, hence, are risk-averse at the mean (that is, the average consumer is risk-averse). If, on the other hand, $\gamma_0 = 0$, then this would imply that consumers are insensitive to such deviations and are, hence, risk-neutral at the mean. If $\omega_0 > 0$ and $\gamma_0 > 0$, that is, if utility function is convex in quality, the implication of this is that expected utility is increasing in $E_{ti}\left[\left(X_{ijt} - E_{ti}\left[X_{ijt}\right]\right)^2\right]$, which suggests risk-taking behavior at the mean under uncertainty (thus, the consumers may get a higher or lower quality than they expected and they derive positive utility from that).

Finally, if consumers are found indeed to be risk averse in the mean (that is the average consumer is risk averse), this would imply that, keeping everything else constant, consumers would prefer brands that they are certain about over the ones that they are uncertain about. However, we should note that this does not mean that they will prefer a brand that is a "low quality" brand with certainty over a brand whose expected quality is higher but the consumer does not exactly know its quality level. Expected utility is a function of expected quality (means), as well as the variance term. The mean expected quality may be high enough for a brand that a risk-averse consumer would prefer a brand associated with high expected quality and some variance of quality beliefs (provided that that the consumer is quality sensitive) over a brand with a low expected quality level and very low or zero variance of quality beliefs (the consumer is almost sure that this is a very low quality brand).

Choice Probabilities

Under the assumption of i.i.d. extreme value error term ε, the probability of consumer *i* choosing brand *j* at time *t* takes the form of a multinomial logit choice probability (McFadden 1974):

$$q_{ijt} = \frac{e^{E[V_{ijt}]}}{\sum_{l=1}^{J} e^{E[V_{ilt}]}} \tag{24}$$

This probability is conditional on the price sensitivities α_i, attribute weights ω_i, risk aversion coefficients γ_i, and consumer expectation errors z_{ijt}. For each consumer *i*, the collection of these random variables is denoted by υ_i. Thus, the likelihood of consumer *i*'s making the purchases indicated by D_{ijt} is given by:

$$L_i(\theta) = \int_{\upsilon_i} \prod_{t=1}^{T} \prod_{j=1}^{J} q_{ijt}(P_{it}, A|\upsilon_i)^{D_{ijt}} f(\upsilon_i) d\upsilon_i \tag{25}$$

where θ is the parameter vector consisting of $\alpha_0, \sigma_\alpha, \omega_0, \sigma_\omega, \gamma_0, \sigma_\gamma, \sigma_{A_n}, \sigma_{A_s}, A_{j_n}, A_{j_s}, \sigma_{x_n}, \sigma_{x_s}$. Hence, we will be estimating a heterogeneous logit model (mixed logit model). In regard to the distributional assumptions of the stochastic utility (error terms, or taste shocks, that are observed by the consumer but not observed by the analyst) and the random effects (taste heterogeneity and heterogeneity in price sensitivities) that enter the deterministic component of utility, we should note that the assumption made is that the covariance between the random effects in the deterministic component of utility (taste heterogeneity and heterogeneity in price sensitivities) and stochastic utility (error terms or taste shocks) are zero. The same assumption is made in many discrete choice models irrespective of the distributional

assumptions about the stochastic utility (e.g., the same assumption is made when these error t**erms or taste shocks are assumed to be normal leading to a probit model).

Cross-Country Comparisons

As we previously discussed, we are interested in comparing 1) initial uncertainty associated with store brands (versus national brands); 2) the precision of information contained in use experience associated with store brands (versus national brands), as both a result of quality consistency over time and ability of consumers to evaluate the consumption experience, i.e., the consumed quality levels, 3) the perceived quality levels of store brands (versus national brands); and 4) consumer price and quality sensitivities and their extent of risk-aversion (or risk-taking) across the three countries we study.

In comparing parameter estimates across data sets, logit models (as well as probit models) pose a problem because the parameters are identified only up to a scale constant (Ben-Akiva and Lerman, 1985). This scale constant is inversely proportional to the variance of the error in the utility function in the logit model. Therefore, direct comparison of the parameters across different markets is not desirable because such comparisons are confounded by the error variances (Swait and Louviere, 1993). However, it is possible to compare the ratio of the parameters across datasets, because the scale constant cancels out in the ratio of parameters.

To test the expectations we discussed in Section 2 in regard to the reasons that may underlie the differential success of store brands in the US and Europe, we constructed five measures.

1. Prior (Initial) Uncertainty

First, to compare the initial uncertainty levels associated with store brands versus national brands, ratio r_1 is defined as the ratio of the standard deviation of the prior perception of store brands to the standard deviation of the prior perception of national brands:

$$r_1 = \frac{\sigma_{A_s}}{\sigma_{A_n}}$$

where σ_{A_s} is the standard deviation of the prior perception of store brands, and σ_{A_n} is the standard deviation of the prior perception of national brands. This variable captures the relative prior uncertainty associated with store brands versus national brands. Note that σ_{A_s} may be higher than σ_{A_n} in all countries (and we can compare parameters directly within the datasets). However, for initial uncertainty levels associated with store brands to be *relatively* higher in the US than the UK and Spain to partially explain the differential success of store brands across these three counties, we would need to obtain a value of r_1 that is larger in the US than in the UK (and Spain), where store brands have higher market shares. Thus, a large r_1 in the US compared to a small r_1 in the UK would suggest that initial uncertainty levels associated with store brands *vis a vis* national brands are higher in the US than in the UK. Hence, we expect r_1 to be larger in the US than in Europe, *ceteris paribus.*

2. Precision of Information contained in Use Experience

To compare the precision of information contained in use experience (which is a function of both quality consistency over time and consumers' ability to evaluate quality

from consumption occasion to consumption occasion) for store brands versus national brands across countries, we need to compare the variance of the experience variabilities of store brands versus national brands across the three countries. Ratio r_2 is defined as the ratio of the experience variability of store brands to the experience variability of national brands:

$$r_2 = \frac{\sigma_{x_s}}{\sigma_{x_n}}$$

where σ_{x_s} is the experience variability of store brands, and σ_{x_n} is the experience variability of national brands. A large r_2 (relative to a small one) would indicate that the precision of information contained in store brands ($1/\sigma_{x_s}$) versus national brands ($1/\sigma_{x_n}$) is lower than it is the case with a small r_2. We should again note that in each country, the precision of information contained in use experience may be higher for national brands than store brands. We expect the value of r_2 to be smaller in countries where store brands have higher market shares, *ceteris paribus*.

3. Risk versus Price Sensitivity

Ratio r_3 is defined as the ratio of consumers' mean risk aversion level to their mean price sensitivity:

$$r_3 = \frac{\gamma_0}{\alpha_0}$$

where γ_0 is the mean risk aversion and α_0 is the mean price coefficient.

In a market where the market shares of stores brands are higher, we expect consumers to be relatively more price sensitive than risk averse. Thus, it is expected that

the value of r_3 is smaller in the countries where store brands have higher market shares, *ceteris paribus*.

4. Quality versus Price Sensitivity

Ratio r_4 is defined as the ratio of consumers' mean quality weight to their mean price sensitivity:

$$r_4 = \frac{\omega_0}{\alpha_0}$$

where ω_0 is the mean quality weight, and α_0 is the mean price coefficient. In a market where the market shares of stores brands are higher, we expect consumers to be less more quality sensitive than price sensitive. Thus, it is expected that the absolute value of r_4 is smaller in the countries where store brands have higher market shares, *ceteris paribus*.

5.Quality Differentials between Store versus National Brands

Finally, ratio r_5 is defined as the ratio of the difference between the mean (perceived) quality level of the best national brand (i.e., the national brand with the highest mean quality) and the mean (perceived) quality level of the store brand to the mean (perceived) quality level of the best national brand. In a market where store brands have higher market shares, the quality differences between store brands and national brands are expected to be smaller. Therefore, it is expected that the value r_5 is smaller in countries where store brands have higher market shares, *ceteris paribus.*

We are using these five ratios to test whether the theoretical implications of the signaling theory and the theory on decision-making under uncertainty partially explain the differences in store market shares in the US versus Spain and the UK. The more ratios are

found to be in the expected order in Spain and the UK versus the US, the stronger evidence we would have for our proposition that these theories partially explain differential store brand performances. However, no single ratio is a necessary or sufficient condition for market shares to be larger or smaller in a country since there are other factors such as industry structure and retailer competition, which affect market shares as well and it is beyond the scope of this paper to analyze these.

Identification

The first identification problem is that adding a constant to attribute levels leads to no-uniqueness of the attribute weight and risk aversion parameters. One way of eliminating this identification problem is to require that

$$\sum_{j=1}^{J} A_j = 0, \tag{26}$$

Here the set of J includes both the store and national brands. This restriction is the same as the restriction in Elrod's (1988) paper for eliminating the translational invariance and in Erdem's (1998) umbrella branding paper.

The second identification problem is the scale invariance in equation (19) (Erdem 1998). To remove this indeterminacy, we normalize the distribution of ω_i, that is, by imposing the requirement:

$$\sigma_{\omega} = 1 \tag{27}$$

The last identification problem in the model is rotational invariance (Erdem 1996, 1998). One possible solution to this problem is to fix the direction of the utility weights vector and the risk aversion parameters as below:

$$\omega_i \sim N(\omega_0, 1) \qquad \rho_i \sim N(\rho_0, \sigma_\rho^2) \tag{28}$$

Model Estimation

Let $LogL(\theta)$ denote the log-likelihood function for the observation period *T*. We can write

$$LogL(\theta) = \sum_{i=1}^{I} \ln L_i(\theta) \tag{29}$$

The model is estimated using the method of simulated maximum likelihood (SML) because the discrete choice probabilities needed to construct the likelihood functions are high order integrals over the random variables (e.g., McFadden 1989, Keane 1993, Hajivassiliou and Ruud 1994). The above equation is rewritten as:

$$LogL(\theta) = \sum_{i=1}^{I} \widetilde{L}_i(\theta) \tag{30}$$

where

$$\widetilde{L}_i(\theta) = \frac{1}{N} \sum_{r=1}^{N} \prod_{t=1}^{T} \prod_{j=1}^{J} q_{ijt}(A|\upsilon_{ir})^{D_{ijt}} \tag{31}$$

where $\upsilon_{ir}, r = 1,2,...,N$ are random vectors drawn from the distribution of υ_i, and *N* is the number of draws. It is set to 100 in the estimation.

The Quasi-Newton method with line search maximizes the log-likelihood function. BHHH algorithm is employed to approximate the Hessian.

The parameters to be estimated are as follows: (i) Mean price coefficient α_0 and the standard deviation of the price coefficient σ_α; (ii) Mean utility weight ω_0, note that to solve the identification problem, the standard deviation of the utility weight is restricted to 1; (iii) Mean risk aversion coefficient γ_0 and the standard deviation of the

risk aversion coefficient σ_γ; (iv) standard deviation of the prior perceptions of the national brands σ_{A_n}, and standard deviation of the prior perceptions of the store brands σ_{A_s}; (v) standard deviation of the experience variabilities for national brands σ_{x_n}, and standard deviation of the experience variabilities for store brands σ_{x_s}; and (vi) the estimations of the mean quality levels A_j, $j = 1,2,...,J$.

Data

The models are estimated on scanner panel data supplied by A.C. Nielsen for laundry detergent across three countries: US, UK and Spain. We also estimated the models on toilet paper and margarine in the US and Spain. Store brand market shares in detergent both in Spain and the UK are high: about 38% in Spain and 29% in the UK as opposed to 4% in the US. Similarly, the store brand shares in toilet paper and margarine in Spain (40% and 22%, respectively) are higher than the store brand shares in those categories in the US (14% and 8%, respectively).

We chose detergent as the main category to analyze since previous work has shown that uncertainty indeed exists in this category (e.g., Erdem and Keane 1996).[6] Also, ideally it would be better to choose a category where the number of brands in the category and concentration within the category are similar across the countries studied since we are studying the impact of uncertainty related factors and consumer attitudes towards risk, price and quality on market shares, *ceteris paribus*. Indeed, the number of top national brands in the category across the three countries we study is similar (6 national brands in the US and Spain and 5 national brands in the UK combined with store

brands constitute 70-80% of the market in each country). Additionally, the total number of store brands is similar across the three countries (21 in the US, 20 in the UK and 18 in Spain). We should also note that retail concentration index in the grocery industry in the UK and Spain is not too different from that in the US (UK: 69%, Spain: 60% and U.S. %51).[7]

However, we had also data on toilet paper and margarine in the US and Spain and estimated the model on these data sets to provide some generalizibility across product categories. In the toilet (margarine) product category, the number of top national brands is 5 (6) and 3 (4) in the US and Spain, respectively.

The data sets include household's daily purchase activities and the price information in each of these markets. In the US market, there are 110 stores and 314 households are included in the data set. Their purchase activities are recorded from December 1997 to December 1999. The US panel included purchases of households in Atlanta and Chicago. The UK data set has 214 households, 176 stores, and the date range is from January 1998 to December 1999. 167 households are included in the Spain data set, the time period is from January 1998 to February 2000, and there are 84 stores in the data set. Both the UK and Spain data sets included households across the country, rather than households in specific cities.[8]

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[6] Quality uncertainty has been shown in many other frequently purchased product categories, including toothpaste, toothbrush (Erdem 1998), yogurt (Ackenberg 2000), etc.

[7] Source for the US index: "The future of retail: What You Need to Know", Beverage World, May 25th, 2000, Vol119, Issue 1690. 34-38. Source for the index in Spain: "La gran revolucion esta por llegar", Distribucion y Actualidad, Marzo, 2000, N.280. 8-12." Source for the UK index: Euromonitor.

[8] Nielsen provided us with these data by randomly drawing from the larger panel sets they have. Thus, the data sets we estimate our model on constitute a subset of the panel data Nielsen has.

In any ratios that involve the price coefficient, one needs to make sure that the utility is expressed in the same monetary units to assure comparability across counties. To express prices (and, hence, utility) in common monetary units (US $), we used the mean exchange rate during the period of analysis to convert every individual purchase price in the data from the U.K and Spain into $ prices. To do so, we collected monthly exchange rates data for the period of the analysis and calculated one mean exchange rate for each country. The exchange rate used for UK was 1.638 (1 Sterling Pound=1.638 US $) and for Spain, it was 0.006 (1 Peseta=0.006 US $). We also calculated the standard deviations of the monthly exchange rates to see whether there have been large fluctuations during the period for which we have the scanner panel data sets but standard deviations were very low (in the case of Sterling Pound/US $ rates, it was 0.028; and in the case of Peseta/US $ rates, it was 0.00052).

In all three markets, the store brands are lumped together as the "store brand". Lumping all store brands into one category implies that the generalizability of the results hinges on the assumption that the variance across different store brands in a given country does not alter the results we obtained significantly. However to test the robustness of our results to this manipulation, we estimated a model where only the top two store brands (the two store brands with the highest market shares) were included in the analysis; and separate mean quality parameters were estimated for each. The results were not sensitive to this alternative specification of "store brands." We would like to note that this manipulation constitutes a very conservative test since the differences between national and store brands are expected to be even bigger with lower-share store brands.

In the detergent category, 6 national brands and the "store brand" that account for 70% of the market share are selected for the model estimation in the US and Spain. In the UK market, 5 national brands and the "store brand" that account for 80% of the market share are selected for the model estimation. In the toilet paper and margarine, the brands under analysis captured more than 90 % of the total market share in each country. Tables 1a, 1b and 1c report the markets shares and average prices paid (coupons excluded) in our samples in each product category.

We should also note that although previous research has shown that most frequently purchased consumer packaged goods such as detergents, toothbrushes etc. are subject to uncertainty (e.g., Erdem 1998), our model allows us to test whether there is indeed uncertainty in these markets. If the prior variance of the quality level of national brands (σ^2_{An}) and/or of store brands (σ^2_{As}) were statistically insignificant, this would suggest the absence of uncertainty.

Empirical Results and Discussion

The purpose of this paper is to test whether uncertainty and uncertainty related consumer processes, as well as consumer risk, price and quality attitudes play a role in explaining differences in market shares in the US versus Europe, which can be done only if an explicit model of uncertainty is formulated and estimated. Hence, estimating competing models is not the aim of this paper. However, to have a sense of model fit, we estimated two models to compare in-sample fits. Other than our full model presented in Section 3, we estimated two different models by setting the risk parameter in Equation 17 to zero (γ=0) and not allowing for any Bayesian updating. This model then becomes the static heterogeneous logit model, which is nested in our full model. We estimated a

second comparison model, where we added "dynamic" to the first comparison model with the static heterogeneous logit specification in a reduced form way. More specifically, we added to the first comparison model a weighted average of past purchases variable using the exponential smoothing specification of Guadagni and Little (1983) to capture the impact of past purchases (purchase feedback) on choices. This model is not nested in our full model but it nests the first comparison model. Thus, the second comparison model is the well-known heterogeneous logit specification with state dependence (please see Keane 1997 for a review).

Table 2a, 2b and 2c report the log-likelihoods and Bayesian Information Criteria (BIC) for Spain, UK and US, respectively, in the detergent category (Tables 4a and 4b reports these statistics in the US and Spain in toilet paper and Tables 6a and 6b report these statistics in the US and Spain in margarine). In all countries and categories, adding past purchases to the static heterogeneous logit formulation improves fit in a statistically significant way. The second comparison model and our model are nested but BICs have been traditionally used in these settings and they suggest that our full model indeed fits better.

The parameter estimates in all the three categories (presented in Tables 3a, 3b, 5a, 5b, 7a and 7b) have the correct signs and are statistically significant in all the countries, except for the experience variability parameter for store brands in the detergent category in Spain and risk parameter in the margarine category in Spain. In all countries, price has a negative effect on utility, whereas perceived quality has a positive effect on utility. The risk coefficients, γ_0, are negative. This result, combined with a positive mean utility weight, ω_0, suggests that consumers are risk averse—the increased perceived quality

variance (perceived risk) decreases consumers' expected utility and lowers brand choice probability, in all countries and product categories, except for the margarine category in Spain, where the risk coefficient is negative but statistically not significant.

The statistically significant prior variances of consumer quality perceptions in all the countries and product categories show that there is consumer uncertainty about quality in these markets. The experience variabilities for national brands are statistically significant as well in all countries and categories. The experience variabilties for store brands are statistically significant as well, except for the detergent category in Spain, which overall indicate that usage experience provides only noisy information.

The results also show that the prior standard deviation of quality perceptions of national brands is much smaller than the standard deviation of quality perceptions of store brands in the US (for example, in the detergent category, σ_{A_n}=0.420, σ_{A_s}=3.448); whereas they are about the same in the UK. In Spain, the standard deviation of quality perceptions of store brands is indeed smaller than that of national brands in the detergent and margarine categories, and the standard deviation of quality perceptions of store brands is bigger than that of national brands in the toilet category. Thus, prior uncertainty about store brands compared to national brands is much higher in US in all categories, they are about the same in U.K. (in detergent since we have only the detergent data from the UK) and in Spain, prior uncertainty is larger for national brands, except for the toilet paper category.

In all the three product categories, experience variabilities are consistently higher for store brands than national brands in the US. The same holds for the detergent category in the UK. This suggests that consumers believe that the quality levels of national brands

are more consistent compared to that of the store brands. The result is consistent with the belief in the US that in general, national brands deliver more consistent quality levels compared to store brands. In Spain, where the market shares of store brands are very high, the experience variabilities of national and store brands are the same in the margarine category but experience variabilities of store brands are smaller than that of national brands in the detergent and toilet paper category.

Given the purposes of the study, the important results are associated with the five ratios we discussed before. Table 3c reports these five ratios across the three countries in the detergent category. Tables 5c and 7c report these ratios for toilet paper and margarine, respectively, in the US and Spain. Recall that we expect these ratios to be higher (in absolute value), *ceteris paribus,* for countries where store brand market shares are lower due to higher uncertainty associated with store brands (higher prior uncertainty, as well as higher experience variabilites), and due to higher risk and quality sensitivities and lower price sensitivities. We should note the *ceteris paribus* nature of our expectations here. Although, the more ratios turn out to reveal the expected pattern across countries, the stronger evidence we would have for consumer uncertainty related drivers behind differential market shares of store brands across countries, not all ratios may reveal the same pattern. For example, in a specific category and country, the prior uncertainty of store brands may be relatively very low (suggesting a high market share for store brands, *ceteris paribus*) but at the same time the quality differentials between national and store brands may be very large and consumers may be very quality sensitive (suggesting a low market share for store brands, *ceteris paribus*) and the latter affect may dominate the former, leading to a low observed market share for store brands in that particular market.

We will discuss in detail the detergent results and briefly summarize the margarine and toilet paper results, which are very consistent with the results obtained in the detergent category. The ratios reported in Table 3c strongly support the notion that consumer learning and perceived risk play an important role in consumer's store versus national brand choices. First, let's look at the estimates of r_1, which are the ratios of the prior standard deviation of quality perceptions of store brands to that of national brands. These show that the US has the highest ratio (8.202) followed by much smaller ratios in the UK (0.994) and Spain (0.568). Thus, the US, which has a much lower market share of store brands compared to the UK and Spain, is also the country where initial uncertainty about quality is much higher for store brands than national brands. In the UK, the uncertainty is about the same for national versus store brands whereas in Spain, consumers seem to be pretty certain about the quality levels of store brands (it is important to note that the consumers may believe that store brands are indeed of "low" quality; lack of uncertainty does not indicate "high quality", it just means that consumers believe that they know what the quality levels are).

The figures for r_2, which is the ratio of the standard deviation of the experience variabilities of store brands to that of national brands across the three countries, suggest that the US has the largest ratio (r_2 = 3.870), followed by the UK (r_2 = 1.755) and Spain (r_2 =0.093). Thus, store brands in the UK and Spain deliver more consistent quality levels over time than store brands in the US, therefore, risk averse consumers are more likely to choose national brands due to the smaller risk associated with purchasing the national brands in the US.

The ratio of risk aversion to price sensitivity, r_3, is highest in the US (260.342), and lowest in Spain (1,155). Thus, consumers in the US seem to be relatively more risk averse than price sensitive compared to their Spanish counterparts. They are so *vis a vis* the UK consumers as well.

The absolute value of the ratio of mean quality weight to price sensitivity, r_4, is highest in the US (1.095), and lowest in Spain (0.668). Thus, American consumers seem to be relatively more quality sensitive rather than price sensitive compared to the Spanish consumers.

Finally, to compare the relative quality level of store brands vs. national brands, we need to look at r_5, which reflects the perceived quality differences between national and store brands. The larger this ratio is, the larger the differences. The perceived differences seem to be largest in the US and lowest in Spain but the differences across countries in this case seem to be much smaller than in the first three ratios.

To summarize the results, the US seems to be subject to more initial quality uncertainty associated with store brands and has less consistent quality levels over time for store brands. The consumers in the US are also relatively more risk averse than price sensitive than both the consumers in the UK and Spain. They are also relatively more quality sensitive than price sensitive than the Spanish consumers. Finally, in the US, there are higher perceived quality differences between national and store brands than it is the case both in the UK and Spain. However, the differences among the US versus the UK/Spain are highest for the first three ratios and these first three ratios reflect "uncertainty" related mechanisms. Thus, differential uncertainty associated with store brands, differences in quality consistency over time and differences in relative risk

behavior seem to drive the differential market shares of store brands in the US versus the UK/Spain, as we had hypothesized.

The results obtained in the toilet paper and margarine categories for the US and Spain are very consistent with the detergent results and provide further evidence for quality uncertainty related reasons that affect the differential success of store brands in the US versus Europe. All the ratios reveal the expected patterns in both categories, except for the ratio of risk aversion to price sensitivity, r_3, in the toilet paper category and the absolute value of the ratio of mean quality weight to price sensitivity, r_4, in the margarine category. This suggests that in the toilet category, the US consumers are relatively more price sensitive than risk averse compared to their Spanish counterparts and, in the margarine category, the US consumers are relatively more price sensitive than quality sensitive compared to their Spanish counterparts. This result seems to have face validity since indeed in Spain margarine category is known to be a category where consumers are quality sensitive since margarine is mainly used as a spread on the bread or toast for breakfast or snack rather than for cooking purposes. Overall, our findings are very encouraging in regard to the generalizability of our results to other frequently purchased consumer packaged goods.

Conclusion

This paper empirically studied consumer choice behavior in regard to store brands in the US, UK and Spain in the detergent category and in the US and Spain in the toilet paper and margarine categories. We estimated a model of consumer brand choice in an environment where they are uncertain about brand attributes, which may create consumer perceived risk. In the model, usage experience gives consumers noisy signals about brand

attributes, and the functional form for the experience effect is derived from the Bayesian learning framework. In this framework, store brands will be relatively more successful if consumer prior uncertainty about them is relatively low (for example due to consistent communication messages in the past), and if a product delivers consistent attribute levels over time making use experience more diagnostic source of information in regard to quality levels, if consumers are relatively more price sensitive, less quality sensitive and less risk-averse, ceteris paribus. The main aim of the paper was to analyze whether these factors play a role in explaining differential success of store brands in the US versus Europe.

We used scanner panel data on detergent from the US, UK and Spain and on toilet paper and margarine from the US and Spain to estimate the model and compare consumer behavior in regard to store brands across the three countries. We find strong evidence for consumer learning about quality, consumer quality expectations, perceived risk and consumer preferences for price, quality and risk to explain consumer brand choices. Our results establish that contribute to differences in store brands' strength across the three counties we studied.

We found in this study that in the laundry detergent category, store brands in the UK and Spain markets have less quality uncertainty associated with them, and they deliver more consistent positioning/ quality levels over time compared to the store brands in the US market. We should note here that consistent positioning of store brands in the UK and Spain does not mean that the positioning strategies in these two countries were similar, *per se.* In the UK, store brands in general have a history of having consistent "quality" positioning sustained by extensive investing in store brands whereas in Spain

store brands were introduced and marketed consistently as a cheap "no frills" alternative to national brands (Ryan 1995). Thus, although in Spain and the UK store brands provide more consistent positioning over time compared to the US, the positioning strategies themselves can be different in the UK versus Spain. Given our results, which suggest that consumers are more price and/or less quality sensitive in Spain than the UK, these positioning strategies seem to make sense. Finally, we find that consumers in the UK and Spain are relatively more price sensitive than quality sensitive and risk averse compared to consumers in the US. This explains at least partially why store brands in the UK and Spain behave better than store brands in the US market. The results from the toilet paper and margarine categories were largely consistent with results obtained from the detergent category.

Our results indicate that consistent quality levels and positioning, as well as reducing the gap between the perceived quality levels of national versus store brands would help store brands, *ceteris paribus*. Nevertheless, given the cost considerations, which particular marketing strategy is optimal would depend on consumer price, quality and risk sensitivities in each country and product category. For example, when consumers are price sensitive and relatively quality insensitive, not attempting to reduce quality differentials between store and national brands but reducing prior uncertainty about quality through consistent quality and positioning and differentiating the brand as a basic, no-frills option rather than attempting to "imitate" leading national brands would work better for store brands. However, when consumers are more quality sensitive than price sensitive, a consistent positioning differentiating the store brand as a high (or even

higher) quality alternative to the national brand (such as Mark & Spenser in the UK and El Corte Ingles in Spain) would work better.

There are a few venues for future research. First, one can explicitly study the impact of other marketing mix elements (e.g., advertising) in consumer learning, perceived risk formation and the like to analyze the differential success of store brands across countries. Second, subject to data availability, the analysis can be repeated in non-packaged consumer goods categories. Third, the study can be expanded to more countries to draw some empirical generalizations. Fourth, survey research can be conducted to investigate differences and similarities across countries and product categories in regard to which elements of consistency in positioning (e.g., consistency in packaging versus consistency in advertising, etc.) consumers are sensitive to when forming their quality and risk beliefs about national versus store brands.

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