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A Consumer Behavior Approach to Modeling Monopolistic Competition

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In this paper, we attempt to integrate research on consumer information processing and the consumer choice process with the goal of proposing a general framework for modeling consumer behavior in monopolistically competitive industries. Following a pattern of inductive reasoning, we posit a set of consumer behavior propositions that is consistent with observed results from context effects experiments and the phased decision-making literature. We propose that, faced with many competing brands in a monopolistically competitive environment, consumers can be said to construct consideration sets on the basis of non-compensatory rules and subsequently choose from among competing brands within a consideration set on the basis of compensatory rules. We identify five product-market characteristics that consumers use as heuristics to maximize the probability of making the optimal brand choice while minimizing the cost of acquiring and processing information about competing brands. We propose that consumers use memory and stimuli based information to evolve their unique perceptions of these product-market characteristics. As a follow-up to our inductive approach, we show that the empirically documented context effects are consistent with our behavioral propositions. Finally, we use the propositions to explain several classic cases of consumer behavior observed in the beer, ice-cream, and automobile industries.

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1. Introduction

Within the psychology and consumer behavior literatures, there exists a wealth of experimental data focusing on consumer choice in the presence of “brands” (i.e., heterogeneous variations on a product). Much of the experimental findings, including the attraction effect, the substitution effect, the compromise effect, the lone-alternative effect, and the polarization effect, are collectively known as *context effects*. To date, the literature on context effects and the consumer choice process remains largely empirical in nature. Lacking is a theoretical foundation that attempts to explain, in terms of consumer behavior, *why* context effects exist. In concluding their seminal work on the attraction and substitution effects, Huber and Puto (1983, p. 41) remark that context effects “could be specified as a part of a general framework.” Simonson (1989, p. 159) similarly challenged researchers.

While the marketing literature has devoted much effort to detecting context effects, the mainstream economic literature has remained relatively silent on the topic. Our hope is to create a bridge between these two disciplines by offering a theoretical framework that attempts to explain the empirical observations. We believe that evidence from the context effects and consumer choice experiments suggest a compelling framework within which economists can create rich models of consumer behavior in monopolistic competition and marketing researchers can refine their experiments in context effects. In this paper we develop a general framework that is consistent with the phased decision-making literature and empirical evidence from published context effects experiment. In developing the general framework, we suggest a possible integration among three disparate streams of research: consumer information processing, context

effects, and the consumer choice process. Our general framework rests on four important premises.

1. In a monopolistically competitive environment, consumers may be uncertain about the attributes of some or all of the brands, and may be unaware (and cognizant of their unawareness) of the existence of some brands. In an attempt to maximize the likelihood of making the best purchase decision while minimizing the cost of acquiring and processing information necessary for that decision, consumers can rely on heuristics (*cf.*, Bettman 1979; Bettman, Johnson, and Payne 1991; Biehal and Chakravarti 1986; Nedungadi 1990).
2. Consumer choice involves sequential stages that result from consumers' attempts to resolve uncertainty. This notion of phased decision-making is well documented (*cf.*, Kardes et. al. 1993; Bettman 1979; Biehal and Chakravarti 1986).
3. Consumers rely on available information (which maybe be imperfect, incomplete, and/or obsolete) to construct their perceptions of product-markets (the set of all competing brands known to the consumer juxtaposed according to the perceived similarity of salient attributes and the anticipated impact of those attributes on the consumer's utility; for a review of this research stream see Alba, Hutchinson, and Lynch 1991; Kardes 1994).
4. Consumers' perceptions of product-markets influence their subsequent consideration and choice (*cf.*, Day, Shocker, and Srivastava 1979; Ratneshwar and Shocker 1991).

We identify five salient characteristics of product-markets that consumers can use as choice heuristics: *cluster size*, *cluster variance*, *cluster frontier*, *granularity*, and *brand variance*. These

product-market characteristics provide information for a non-compensatory short-listing of brands and subsequent compensatory comparison of short-listed brands.¹

We organize the remainder of the paper as follows. In the next section, we explain the need for the framework, review pertinent literature, and present the core propositions. Next, we show how our framework is consistent with observed context effects and demonstrate strategic applications of the framework. Finally, we offer concluding remarks on the implications of our framework for future research.

2. Need for a Framework

For perfectly competitive and monopoly industries, the consumer choice process is relatively trivial. In the case of perfect competition, competitive forces assure the consumer that the attributes of one brand are identical to the attributes of all other brands. In the case of monopoly, there is only one brand about which the consumer must glean attribute information. Monopolistically competitive industries, however, present a special problem for the consumer vis-à-vis information gathering. Not only are there many brands from which to choose, but each brand's attribute combination differs from that of every other brand in some (potentially) non-trivial fashion. Because the number of brands can be large, as consumers attempt to make optimal decisions, they must trade-off an increase in the probability of purchasing a “wrong” brand (i.e., a brand that does not maximize utility) for a decrease in the costs of information gathering and processing. At one extreme, the consumer can purchase the first brand s/he encounters, thus incurring a significant risk of having made a sub-optimal purchase decision. At the other extreme, the consumer can collect enough information to minimize the risk of a sub-

¹ Non-compensatory evaluation involves drawing a “line in the sand” that separates brands into those deemed “acceptable” and “unacceptable.” For example, a consumer in the bond market may remove from consideration all bonds with less than an A rating. Compensatory evaluation involves weighing tradeoffs in attributes of different brands. For example, a consumer in the bond market may tradeoff a Aaa rating for a Aa rating in exchange for an extra half-point in interest.

optimal decision, but only at considerable cost. Toward which extreme the consumer tends depends consumer involvement, i.e., the extent to which a consumer is willing and able to evaluate brand attributes. The framework we propose assumes consumer choice situations in which selecting a sub-optimal brand is costly enough to warrant sufficient involvement, but not so costly as to require complete information.

Modeling consumer choice requires examining both the various stages of consumer decision-making and the factors that influence these stages (Howard and Sheth 1969; Narayana and Markin 1975; Silk and Urban 1978; Urban 1975). In the case of high consumer involvement, the consumer choice process typically involves three distinct stages: *product-market perception*, *consideration*, and *choice*. The consumer forms a product-market perception—the mental juxtapositioning of brands according to salient attributes (*cf.*, Biehal and Chakravarti 1986; Kardes et al. 1993; Shocker et al. 1991)—by relying on memory and other physically present information (Lynch and Srull 1982). The consumer perceives the product-market as a collection of known brands that the consumer has utility-ranked according to salient attributes and based on incomplete information and imperfect experience. Given the perceived product-market, the consumer next uses non-compensatory screening to form a consideration set (Bettman, Johnson, and Payne 1991; Bettman and Park 1980) from among the set of all perceived brands.² Finally, given the consideration set, the consumer uses compensatory evaluation to arrive at a final choice (Bettman 1979; Johnson and Meyer 1984; Lussier and Olshavsky 1979; Payne 1982).

Consistent with contemporary research on decision-making (*cf.*, Deighton 1984; Ha and Hoch 1989; Hoch and Deighton 1989; Hoch and Ha 1986), we propose that consumers follow an *iterative* choice process of: (1) product-market perception, (2) consideration of a single subset of

² For example, a consumer might immediately split the automobile product-market into two sets: compact cars and SUV's, and not consider compact cars. Similarly, a consumer might immediately split the housing product-market into three sets: apartments, one- and two-bedroom houses, and three- or more-bedroom houses, and consider only one- or two-bedroom houses. In an empirical study, Hauser (1978) attributed 78% of explained variance in brand choice to consideration and only 22% to preferences among the considered brands.

brands within the perceived product-market, (3) choice of one brand from among the consideration set, (4) consumption/experience of the chosen brand, and (5) adjustment of product-market perception on the basis of the consumption/experience. Through this repetitive process, consumers iteratively adjust their perceived product-markets according to their consumption experiences.

Next, we propose that consumers, faced with the two unacceptable extremes of gathering no product-market information and gathering all product-market information, will utilize heuristics in an attempt to wring maximal information from the product-market at minimal cost.

3. Incomplete Information and Imperfect Experience

Let the *true brand universe* be the positioning of all existing brands according to their true (as opposed to perceived) determinant attributes.³ Assuming that the cost of gathering complete information about all existing brands is prohibitive, consumers will not observe the true brand universe, but will mentally construct *estimated brand universes* based on available information. Estimated brand universes differ from the true brand universe due to *external uncertainties*: (1) partial information—consumers may be unaware of all the brands in the true universe, (2) measurement error—consumers may measure brands’ attributes inaccurately or may be unaware of a particular attribute,⁴ and (3) obsolete information—consumers may fail to update their mental pictures of the true brand universe as quickly as the brand universe evolves (*cf.*, Burke and Srull 1988; Krugman 1965).

³ Determinant attributes, by definition, have no impact on consumer choice. However, what attributes are considered salient may vary across consumers. For example, a car buyer who does not understand the concept of “torque” will find engine torque ratings to be non-salient, while a car buyer who is also a mechanic may find torque ratings salient.

⁴ This may arise from, among other things, involvement (Petty and Cacioppo 1990). Peter and Olsen (1997) describe this as “misinterpretation of the environment.”

Let the utility a consumer derives from consuming a brand be determined by the consumer's *true utility function*. Consumers do not observe their true utility functions because of the prohibitive cost of acquiring detailed experience with all attributes of all brands and instead make purchase decisions on the basis of their *estimated utility functions*. Estimated utility functions differ from true utility functions due to *internal uncertainties*⁵: (1) absolute utility error—consumers may be uncertain as to the future consequences of their purchase decisions (e.g., Will the fact that automobile airbags reduce injury bring me peace-of-mind?), and (2) relative utility error—consumers may be uncertain about the relative influence or weight of each attribute on their utility functions (e.g., Will the peace-of-mind that airbags bring be as important as the feeling of power obtained via high engine performance?; *cf.*, Simonson, 1989). Consumers with more experience will have estimated utility functions that are closer to their true utility functions.⁶

Following the phased decision-making literature (*cf.*, Biehal and Chakravarti 1986; Kardes et al. 1993; Shocker et al. 1991), we describe the first stage of the consumer choice process, product-market perception, as the consumer's attempt to generate an estimated brand universe on the basis of available information about brands, and to generate an estimated utility function on the basis of past consumption experience.

4. The Iterative Choice Process

Because information/experience gathering is costly, consumers will curtail information/experience gathering at some point and make purchase decisions on the basis of

⁵ This explains, for example, why consumers would be interested in reading a connoisseur's reviews of various wines instead of simply going out and trying the wines themselves.

⁶ The internal and external uncertainties correspond to Manski's (1977) sources of uncertainty in stochastic utility models: non-observable characteristics, non-observable variations in utility, measurement errors, and functional misspecification. While Manski describes these errors as components of a regression error that reflects imperfectly modeled utility, they can be interpreted as components of a choice error that reflect imperfectly anticipated utility.

incomplete information and imperfect experience (cf., Kahneman 1973; Klinger 1975; Brucks 1985; Janiszewski 1988; Park and Young 1986). Through the information and experience gleaned from consumption, consumers may realize that they have misestimated the true brand universe and/or their true utility functions (see Hawkins and Hoch 1992; Hoch and Deighton 1989; Hoch and Ha 1986 for similar expositions). Thus, consumers are able to re-evaluate their estimated brand universes and estimated utility functions “in an ongoing process of adaptation” to their environment (Ratneshwar and Shocker 1991, p. 292; also see Srivastava, Alpert, and Shocker 1984).⁷ This gives us our first proposition:

P₁ Consumer choice follows an iterative process in which consumers use experience gained from consumption to reduce the deviations of their estimated brand universes from the true brand universe and the deviations of their estimated utility functions from their true utility functions.

5. Compensatory and Non-Compensatory Choice Strategies

Whereas compensatory models hold that consumers will trade-off one attribute for another, non-compensatory models maintain that consumers will choose only those brands in which all (conjunctive), at least one (disjunctive), or the most important (lexicographic) criterion exceeds some lower limit (cf., Bettman 1979). Researchers have suggested that, rather than a single process, consumers are likely to use a combination of processes in many choice situations (e.g., Bettman and Park 1980). A non-compensatory strategy might be used to reduce quickly, and at low cognitive cost, the choice alternatives to a manageable number by rejecting those brands that lack one or two key criteria (Peter and Olson 1996). For example, in looking for housing, one

⁷ Consumers can also rely on the reported experiences of other consumers to adjust their estimated brand universes and estimated utility functions (cf., Earl and Potts 2004).

person may begin by considering only apartments with three or more bedrooms, whereas another may begin by considering only suburban locations.

P₂ Consumers employ non-compensatory strategies in the consideration stage of the choice process, and compensatory strategies in the choice stage of the choice process.

6. Clustering

By mentally grouping similar objects, consumers' information processing efficiency and cognitive stability are enhanced (*cf.*, Cohen and Basu 1987; Lingle, Altom, and Medin 1984; Sujan and Bettman 1989). We propose that consumers attempt to minimize the effects of uncertainty by dividing the estimated brand universe into "clusters"—groups of brands positioned closely in an attribute space (*cf.*, Cooper and Inoue 1996; Green and Srinivasan 1990; Harshman et al. 1982).⁸ The consideration stage of the choice process can be characterized as the selecting of one cluster from among competing clusters, while the choice stage can be characterized as the choosing of a single brand from *within* the considered cluster. Thus, the probability of choice is more properly described as the probability of *choice-given-consideration* (*cf.*, Kardes et al. 1993). Finally, we can imagine a consumer considering, in addition to all perceived clusters, a "null cluster" that represents no purchase or a delayed purchase decision.

P₃ Consumers mentally group brands into clusters according to perceived similarities. In the consideration phase of the choice process, consumers select one cluster from among competing clusters and the null ("no purchase") cluster. In the choice-given-consideration phase, consumers select one brand from within the considered cluster.

⁸ Consumers will not, on average, impose non-compensatory limits that do not also mark cluster boundaries. The argument for this is reverse-causal: firms have positioned their brands, *a priori*, on the basis of consumer segments. Thus, to the extent that consumer segments bifurcate at certain attribute levels, brands will follow.

7. Product-market Characteristics

We identify five characteristics of the consumer's perceived product-market that could be useful to consumers in constructing heuristics: *cluster size*, *cluster variance*, *cluster frontier*, *brand variance*, and *granularity*.

a. Cluster Size

Let the number of brands the consumer groups into a single cluster be the *cluster size*. A change in cluster size can imply a change in internal and/or external uncertainties. Larger cluster size may be an indication of lesser external uncertainty concerning the cluster because: (1) observing more brands implies (*ceteris paribus*) that a greater proportion of the true universe is observed (reduced partial information), (2) observing more brands with similar attributes (*i.e.*, brands in the same cluster) can provide confirmation that the consumer has correctly observed attribute levels (reduced measurement error), and (3) observing more brands in a specific cluster can imply a lesser probability of brands altering their attributes; the cluster may be stable over time (reduced obsolete information).⁹

Consumers may also take the number of brands in a cluster as a proxy for the demand for brands in that cluster (*cf.*, Dhar and Glazer 1996; Medin, Goldstone, and Markman 1995; Nosofsky 1987). Thus, a larger cluster size can imply less internal uncertainty concerning the cluster because observing more brands implies greater consumer demand within the cluster, and greater demand implies that consumers' preferences are being satisfied within the cluster. This is consistent with evidence that consumers make use of other people's experience when making purchase decisions (*cf.* Earl and Potts 2004; and Pinske and Slade 1998).

⁹ For example, consumers may have believed that the VHS format would supplant the Betamax format because there were a greater number of brands using the VHS format. Similarly, despite being user-friendlier and employing a more powerful microprocessor, in the 1980's the Macintosh brand lost substantial market share to IBM clones. One possible explanation is that there were a large number of brands in the IBM clone cluster and so consumers took this as a signal of greater survival probability for the cluster. All other things equal, a reduction in external uncertainty increases the relative demand for brands within the cluster for risk-averse consumers.

[Insert Figure 1 here]

Additionally, people have inherent motives to justify their decisions to others and to themselves (Baumeister 1982; Schlenker 1980; Blau 1964), to bolster self-esteem (Hall and Lindzey 1978), to alleviate cognitive dissonance (Festinger 1957), and/or to reduce anticipation of regret (Bell 1982). Cluster size can help consumers seek (1) to justify their behavior to others in order to verify that they have not succumbed to external uncertainties, and (2) to confirm their behavior to themselves in order to verify that they have not succumbed to internal uncertainties. In sum, observing a larger cluster can imply (1) more brand information (*i.e.*, less external uncertainty) and (2) more affirmation by other consumers (*i.e.*, less internal uncertainty).

Due to cognitive constraints, consumers are likely first to compartmentalize alternatives (*i.e.*, “shortlist”) and subsequently resort to detailed analysis of the shortlist (Bronnenberg and Vanhonacker 1996; Gensch 1987; Kardes et al 1993; Shocker et al 1991). Cluster size provides a ready heuristic for initial shortlisting and hence we expect cluster size to directly influence consideration. This line of reasoning is consistent with the “portfolio effect” (Kahn et al. 1987) which suggests that individuals exhibit a tendency toward selecting that *group* of objects with the largest number of elements because it is thought to give them greater flexibility in making the final choice (see also Sivakumar 1995). We do not, however, expect cluster size to influence the choice stage because, at this stage, a consumer is likely to resort to more involved decision-making and is less likely to resort to heuristics (*cf.*, Chaiken 1980; Petty, Cacioppo, and Schumann 1983).

P₄ The probability of a consumer considering brands within a given cluster increases as the perceived size of the cluster increases, ceteris paribus.¹⁰

¹⁰ In cases of lower consumer involvement, one might argue the reverse of P_4 . Specifically, increasing the number of brands in a cluster increases the quantity of information the consumer would need to process were the consumer to select the cluster. With low consumer involvement, the

b. Cluster Variance

Let the average dispersion of brands around the cluster center be the *cluster variance*.¹¹ A change in cluster variance can imply a change in internal and external uncertainties. Consumers may interpret larger cluster variance as an indication of greater external uncertainty because observing a greater variance among brands within a cluster could indicate that (1) there are brands within the cluster of which the consumer is unaware (i.e., there is more “space” between known brands where one could surmise unobserved brands existing), (2) consumers have incorrectly grouped inherently disparate brands into the same cluster (i.e., the brands actually comprise two low-variance clusters rather than one high-variance cluster), (3) consumers have erroneously measured some of the attributes (i.e., if the attributes were correctly measured, the disparity among the brands would be less), and (3) the brands’ attributes are changing as firms search for improved brand positions (i.e., the cluster represents a new grouping of brands such that firms are exploring disparate niches within the new cluster). Consumers may also interpret larger cluster variance as an indication of greater internal uncertainty because: (1) observing a greater variance among brand attributes within a cluster implies greater uncertainty regarding the consequences of a purchase, and (2) high cluster variance may increase error in estimating the utility of consumption by sending-out confusing signals about attribute weights.¹²

[Insert Figure 2 here]

In summary, greater cluster variance can imply greater perceived internal and external uncertainties. Two possible mechanisms explain the link between uncertainty and decision-

anticipated cognitive cost of processing that information can be high enough (relative to the expected reward from avoiding a sub-optimal choice), that the likelihood of the consumer considering the cluster declines.

¹¹ For a cluster comprised of n brands with k attributes located at (a_1^1, \dots, a_k^1) through (a_1^N, \dots, a_k^N) where a_k^n is the value of the k^{th} attribute of the n^{th} brand, the center of the cluster is (a_1^c, \dots, a_k^c) where $a_k^c = \frac{1}{N} \sum_{n=1}^N a_k^n$, and the variance of the cluster is $v = \frac{1}{N+K} \sum_{n=1}^N \sum_{k=1}^K (a_k^n - a_k^c)^2$.

¹² For example, a consumer who otherwise knows nothing about computers and observes three computer brands with microprocessor speeds of 1.8 GHz, 2 GHz, and 2.2 GHz can be more confident of the utility she can expect to gain from her brand choice than she would have been had she observed three brands with speeds of 1 GHz, 2 GHz, and 3 GHz. Greater dissimilarity among brands in a cluster, ceteris paribus, implies a greater potential opportunity cost to inadvertently selecting a sub-optimal brand.

making. The omission-detection perspective suggests that when consumers become sensitive to missing information, they form moderate judgments (Kardes and Sanbonmatsu 1993; Sanbonmatsu et al 1997; Sanbonmatsu, Kardes, and Herr 1992; Sanbonmatsu, Kardes, and Sansone 1991; Huber and McCann 1982; Johnson and Levin 1985; Ross and Creyer 1992). The accessibility-diagnostics model suggests that, in addition to being able to access information, the diagnosticity of information is important in decision-making (Fazio, Powell, and Williams 1989; Feldman and Lynch 1988; Herr, Kardes, and Kim 1991; Lynch, Marmorstein, and Weigold 1988). In these terms, we expect high cluster variance to make the focal attribute less diagnostic and hence render the overall cluster less attractive. In addition, the diagnosticity hypothesis in the research on similarity processes and categorization (*cf.*, Tversky 1977; Tversky and Gati 1982) suggests that the diagnostic value of attributes is determined by and determines the similarity between brands. Typically, cluster variance should decrease as the similarity between brands in the cluster increases. Thus, clusters with lower variance should be preferable (also see Medin, Goldstone, and Markman 1995; Markman and Medin 1995).

P₅ The probability of a consumer considering brands within a given cluster decreases as the perceived variance of the cluster increases, ceteris paribus.

c. Brand Extrapolation and the Cluster Frontier

Let the **cluster frontier** be the combination of attribute values such that each attribute value is equal to the maximum of the attribute values over all brands in the cluster.¹³ Let the **cluster origin** be the combination of attribute values such that each attribute value is equal to the minimum of the attribute values over all brands in the cluster.¹⁴ By weighting attributes according to their importance (i.e. the utility they yield), a brand's distance from the cluster

¹³ A cluster frontier is a segment-specific case of an ideal point (Kamakura and Rajendra 1986). An ideal point is conceptualized as a universal preference, specified at the individual or household level. Cluster frontiers articulate various ideal points at the customer segment level.

¹⁴ For example, in a three-brand three-attribute cluster with brands positioned at (2,1,4), (3,4,3), and (5,2,2), the cluster frontier is positioned at (5,4,4) and the cluster origin is positioned at (2,1,2).

origin will be directly proportional to the utility the consumer expects from consuming the brand.¹⁵ It is possible for a cluster's frontier to be either occupied (i.e., the consumer is aware of the existence of a brand within the cluster that combines the best attributes of all the known brands) or unoccupied (i.e., the consumer imagines the possibility, but does not observe the existence, of a brand that combines the best attributes of all the known brands within the cluster).

Based on their estimated brand universes, consumers can use the positions of observed brands within clusters as *signals* for the positions of additional unobserved brands within those clusters. We refer to this phenomenon as *brand extrapolation*.¹⁶ Consumers may believe that some attributes cannot be traded, or that they can be traded but with diminishing returns. We call these perceived restrictions *technological constraints*.¹⁷ Awareness of technological constraints (brought about by familiarity and knowledge) limits the degree to which consumers perform brand extrapolation (*cf.*, Alba and Hutchinson 1987; Brucks 1985; Simonson, Huber, and Puto 1988; Sujan 1985). The failure to correctly identify technological constraints is an instance of external uncertainty and is more likely to happen with novice consumers than with expert consumers (Figure 3). Because brand extrapolation is costly, it is likely that the consumer will first develop a short-list of brands, and then apply brand extrapolation to the short-list (Batra and Ray 1986; Cacioppo and Petty 1982; Park and Young 1986; Yalch and Elmore-Yalch 1984). Thus, we posit that brand extrapolation occurs in the choice stage and not the consideration stage of the decision-making process.

P₆ Consumers will mentally combine the different perceived attributes from different known brands within the considered cluster to infer the attributes of a (possibly unobserved)

¹⁵ This argument follows Netz and Taylor (2002). Note that, by construction, the axes of the product-market space measure the utility obtained from the attributes.

¹⁶ For example, a consumer who observes a thin crust / 3-cheese pizza at one restaurant and thick crust / 5-cheese pizza at another restaurant can expect the existence of both (1) a thin crust / 5-cheese pizza, and (2) a thick crust / 3-cheese pizza, even if this consumer has not yet encountered these brands.

¹⁷ For example, a consumer who observes an 8-cylinder / 20-mpg car and a 4-cylinder / 50-mpg car understands that additional power comes at a price of diminished mileage, and so may not expect to observe an 8-cylinder / 50-mpg.

best brand. The inferred cluster frontier will combine the best attributes from each perceived brand within the cluster subject to perceived technological constraints.

[Insert Figure 3 here]

P₇ The probability of a consumer choosing a brand, given that the consumer is considering the brand's cluster, decreases as the perceived distance between the brand and the cluster frontier increases, ceteris paribus.

d. Brand Variance

In the presence of external uncertainties, consumers may not be certain about the true attributes of brands. For example, a car may be advertised as getting 25 mpg, but mileage varies based on driving habits and, in any event, is merely an average measure for cars of a specific model, not a measure for a particular car. Thus, consumers are likely to treat “25 mpg” as the mean of a distribution. The case of fuzzy, non-numeric information is even stronger (Deighton 1984; Ha and Hoch 1989; Hoch 1988; Hoch and Deighton 1989; Hoch and Ha 1986). We call the variance of a consumer's estimate of the attribute measures for a brand the *brand variance*.

[Insert Figures 4]

We posit that brand variance negatively moderates the effect of a brand's distance from the cluster frontier on brand choice. Figure 4 shows a consumer's perception of the attributes of three brands under conditions of low and high brand variance. The consumer is aware that the true attribute levels for the brands lie somewhere within the squares, yet the consumer is unaware of the exact levels of the brand's attributes and so is unable to extrapolate an exact cluster frontier. With a perception of the upper and lower limits for the attributes of the brands, the consumer can extrapolate the upper and lower limits for the cluster frontier. The frontier squares in Figures 4 show the ranges within which the consumer would expect to find the cluster

frontiers. Given low brand variance (Figure 4a), if the consumer were to select Brand B or C instead of Brand A, the worst that could happen would be that the true locations of Brands A, B, C, and the cluster frontier would be those shown by the dots within the squares. Despite the uncertainty, and following P₇, the consumer is more likely to choose Brand A over Brand B or C, though perhaps not as readily as in the case of zero brand variance.

Given high brand variance (Figure 4b), if the consumer were to select Brand B or C instead of Brand A, the worst that could happen would be that the true locations of Brands A, B, C, and the cluster frontier would be those shown by the dots within the squares. In this high brand variance case, Brand A ends up being, a posteriori, a sub-optimal choice to Brands B and C. The literature suggests that, in the face of high brand variance, consumers are less likely to make inferences, and are more likely to adjust their judgments for uncertainty (Dick, Chakravarti, and Biehal 1990; Holland et al 1986; Cialdini et al. 1973; Sanbonmatsu, Kardes, and Sansone 1991; Simmons and Lynch 1991).

P₈ A brand's distance from the cluster frontier has a greater effect on the probability of choice-given-consideration under conditions of low (vs. high) brand variance, ceteris paribus.

e. Granularity

Finally, we propose that cross-cluster heuristics (P₄ and P₅) are attenuated (augmented) as a consumer is less (more) able to identify individual brands as belonging to well-defined clusters. Granularity can be described as the “signal to noise” ratio the consumer perceives in relative brand positions.¹⁸

P₉ Increased granularity augments the positive effect of cluster size and the negative effect of cluster variance on the probability of consideration, ceteris paribus.

¹⁸ Granularity can be operationalized as the ratio of the “between” to “within” cluster variances.

8. Consideration and Choice as Lotteries

We can model the two-stage choice process as a compound lottery wherein a brand is a lottery over a set of attribute payoffs, and a cluster is a lottery over a set of brands. Let the actual attributes of the n^{th} brand within the m^{th} cluster be represented by the vector $x_{m,n}$, and the consumer's expectation of the brand's attributes be $\bar{x}_{m,n}$. The utility the consumer obtains from consuming this brand is $u(x_{m,n})$.¹⁹ At the consideration stage, the consumer does not weigh tradeoffs in the attributes of individual brands, but rather selects one cluster via non-compensatory screening. As such, we propose that the consumer will regard the “attributes” of a cluster as the average of the expected attributes of the observed brands within the cluster (i.e. the cluster center).²⁰ The consumer observes N_m brands within cluster m , perceives the average of these brands' attributes, \bar{x}_m , and perceives a variance among the brands' attribute levels of s_m^2 .²¹ The consumer knows that, because s/he has not observed all the brands that exist, the consumer's perception of the cluster center, \bar{x}_m , is measured with error. The greater the error with which the cluster center is measured, the less effective is the cluster-based non-compensatory screening because of the increased probability of erroneously selecting a sub-optimal cluster. Following the central limit theorem, the perceived variance of the cluster center about the true (unobserved) cluster center is s_m^2 / N_m .

¹⁹ We make the standard assumptions that u is continuous and twice differentiable.

²⁰ One might argue that the consumer should use the “best” brand as being representative of the cluster. At the consideration stage, the consumer seeks to characterize the entire cluster for the purpose of selecting one cluster over another. Characterizing the cluster according to the attributes of any single brand requires that the consumer weigh attribute tradeoffs between brands so as to determine the best single brand. This behavior, while possible, eliminates the consideration phase entirely and so is likely to occur only in situations in which the consumer would tend not to follow a two-stage choice process – for example, in cases in which the actual number of brands in the universe is small enough to obviate the need for choice heuristics.

²¹ Let σ_m^2 denote the “population” cluster variance – i.e. the cluster variance that one would measure if one could observe all the brands that exist in the cluster at all the points in time that the brands existed (the latter to allow for the possible movement of brands within the cluster). The observed cluster variance, s_m^2 , is a sample estimate for σ_m^2 , and we have $\lim_{N_m \rightarrow \infty} s_m^2 = \sigma_m^2$.

In the language of utility expectation, the consumer regards each cluster as a lottery. This is not to imply that the consumer expects to randomly select a brand from a cluster. At the consideration stage, the consumer is regarding each cluster, m , as a brand with attributes \bar{x}_m , knowing that, at the choice stage, s/he will (likely) end up consuming a brand with attributes different from those of \bar{x}_m . Because the cognition required for determining the brand to be consumed at the choice stage is absent at the consideration stage, selecting a cluster is analogous to choosing a lottery where the expected attribute set, \bar{x}_m , is the expected payoff of the lottery (cf. Varian 1992, pp. 172-174). The utility of the lottery's expected payoff is $u(\bar{x}_m)$. The expected utility of the lottery is the utility the consumer expects to receive from cluster m , $\bar{u}_m = \sum_{i=1}^{N_m} u(\bar{x}_{m,i})$. The second-order Taylor expansion yields $\bar{u}_m \approx u(\bar{x}_m) + \frac{1}{2} u''(\bar{x}_m) \text{var}(\varepsilon)$ where ε is the deviation of the perceived cluster center, \bar{x}_m , from the actual cluster center. We have shown already that the variance of this error is s_m^2 / N_m . Noting that, for the risk-averse consumer, $u''(\bar{x}_m) < 0$, we substitute into the Taylor expansion and obtain the following:

$$\frac{\partial \bar{u}_m}{\partial N_m} \approx -\frac{1}{2} u''(\bar{x}_m) \frac{s_m^2}{N_m^2} > 0 \quad (1)$$

$$\frac{\partial \bar{u}_m}{\partial s_m^2} \approx \frac{1}{2} u''(\bar{x}_m) \frac{1}{N_m} < 0 \quad (2)$$

These results are, respectively, P_4 and P_5 .

The choice phase can be similarly described wherein the consumer regards each brand as a lottery. At the choice stage, the consumer selects a brand on the basis of perceived (i.e. expected) attributes, knowing that the brand's true attributes may differ from the expected. The utility of the lottery's expected payoff is the utility the consumer would receive from consuming the

brand's expected attributes, $u(\bar{x}_{m,n})$. The expected utility of the lottery is the utility the consumer expects to receive from the brand, $\bar{u}_{m,n}$. Let $\theta_{m,n}^2$ be the measure of brand variance for brand n within cluster m . Applying the second-order Taylor expansion and assuming risk-aversion, we have:

$$\frac{\partial \bar{u}_{m,n}}{\partial \theta_{m,n}^2} \approx \frac{1}{2} u''(\bar{x}_{m,n}) < 0 \quad (3)$$

which is consistent with P_8 .

These results indicate the possible existence of a fundamental link between decision-making under uncertainty and monopolistic competition wherein uncertainty provides a channel by which firms can use brand positioning to impact consumers' expected utilities not simply via influencing perceived attribute *levels* but also by influencing the uncertainties associated with those perceptions.

9. Product Market Characteristics and the Three-Stage Iterative Choice Process

Figure 5 summarizes the iterative three-stage choice process proposed by our framework. The consumer, faced with incomplete information, employs heuristics in an attempt to minimize the cognitive cost of decision-making plus the expected opportunity cost of consuming a sub-optimal brand via consideration and choice. After consuming the chosen product, the consumer revises information about both the product's attributes and the utility gleaned from the attributes. The consumer then adapts his/her perception of the product-market via mentally repositioning the consumed brand and, possibly, reforming clusters. The consumer bases the next purchase decision on this revised mental mapping of the product-market.

[Insert Figure 5 here]

10. Context Effects and Brand Universe Characteristics

Earlier studies focused on demonstrating the existence of context effects (Huber and Puto 1993; Kahn, Moore, and Glazer 1987; Simonson and Tversky 1992). Subsequent investigations have examined reasons for context effects (Simonson and Tversky 1992; Wedell 1991; Wernerfelt 1995), the antecedents to context effects (Mishra, Umesh, and Stem 1993; Sen 1998), and the use of context effects in strategy formulation (Lehmann and Pan 1994; Pan and Lehmann 1993). Though these frameworks provide meaningful insights into specific context effects, they all have a common limitation—none of these frameworks is useful in explaining *all* context effects. We contend that one of the main contributions of our framework is that it can provide meaningful explanation for all context effects.

a. Attraction Effect, Substitution Effect, and Proportionality

The attraction effect refers to the ability of a newly introduced, completely dominated brand (a “decoy”) to increase the share of existing brands positioned close to it (Huber, Payne, and Puto 1982; Huber and Puto 1983; Mishra, Umesh, and Stem 1993; Ratneshwar, Shocker, and Stewart 1987; Sen 1998; Simonson and Tversky 1992; Wedell 1991; Heath and Chatterjee 1995). Within the context of our general framework, we can explain the attraction effect as follows. Consumers regard the brand universe as being comprised of two clusters, one with two brands (the target and decoy) and the other with one (the competitor), P_4 suggests that the probability of consideration for brands in the target cluster increases when the decoy is introduced. Thus, P_4 suggests an increase in the probability of consideration (and hence the *unconditional* probability of choice) for the target. Alternatively, an argument could be made that, because the introduction of the decoy increases the variance of the target brand’s cluster, by P_2 , the probability of consideration for the cluster may decrease. Accordingly, our framework

suggests that the attraction effect should only be observed if the increase in the probability of consideration caused by the increase in the number of brands in the cluster exceeds the decrease in the probability of consideration caused by the increase in the cluster variance (Figure 6a)

Huber and Puto (1983) note that when the decoy brand is positioned such that it asymmetrically dominates the target brand, local substitution effects occur. Describing it as the negative substitution effect, Huber and Puto (1983, p. 38) observe that the decoy “takes share predominantly from similar items” and that the substitution effect is “highly sensitive to the positioning of the new item.” Figure 6b shows the introduction of an asymmetrically dominated decoy into the target brand’s cluster. Prior to the addition of the decoy, the target brand was located at the cluster frontier (when there is only one brand in a cluster, that brand is the frontier). Because the decoy asymmetrically dominates the target brand, the introduction of the decoy pushes the cluster frontier such that the frontier is even with the target on one attribute and with the decoy on the other.²² The movement of the frontier away from the target brand decreases the probability of choice-given-consideration for the target brand (P_7). The substitution effect arises when the increase in the probability of consideration (due to the increase in the size of the cluster— P_4) is outweighed by the combination of a decrease in the probability of consideration (due to the increase in the cluster variance— P_5) and a decrease in the probability of choice-given-consideration for the target brand (due to the movement of the frontier— P_7). If the increase in the probability of consideration through P_4 exactly balances with the decreases in probabilities through P_5 and P_7 , then we have what Huber and Puto describe as *proportionality*, the simultaneous occurrence of the attraction and substitution effects resulting in a proportionally equal decline in the demand for all other brands upon the entrance of a new brand. In summary,

²² This assumes no technological constraints. Huber and Puto’s experiments appear to have been devoid of technological constraints.

the manifestation of cluster size, cluster variance, and brand variance in various combination results in either the attraction effect, the substitution effect, or in proportionality.²³

[Insert Figure 6 here]

b. Extremeness Aversion: the Compromise Effect

Simonson and Tversky (1992) distinguish between two types of extremeness aversion. The first form is the compromise effect, which has been observed to occur symmetrically in a three-brand product-market. For example, adding brand z to the choice set of existing brands x and y increases the preference for brand y . In a symmetric manner, adding brand x to the choice set of existing brands y and z increases the preference for brand y (see Figure 7a). Brand extrapolation provides a possible explanation for the compromise effect (see Figure 7b). Let us assume that the three brands belong to a single cluster. When the consumer is presented with brands x and y , the consumer extrapolates the cluster frontier indicated in Figure 7b. Adding brand z causes the consumer to mentally reposition the cluster frontier to the right. The new cluster frontier is positioned farther from brand x than from brand y (because brand y is more similar to the new brand z than is brand x). According to P_7 , the preference for brand y relative to brand x will increase. Similarly, if the market first consists only of brands y and z , adding brand x moves the cluster frontier up in Figure 7b. The new cluster frontier is positioned farther from brand z than it is from brand y , and, again by P_7 , the preference for brand y relative to brand z will increase.

[Insert Figure 7 here]

The presence of symmetric technological constraints may exacerbate the compromise effect. As Figure 8a shows, when symmetric technological constraints exist, the frontier is at a less extreme position, thereby heightening the compromise effect by reducing the distance of the

²³ Parducci's (1965) range-frequency theory is one of the first to be used to explain the attraction effect, though with not much success. Due to space limitations and the low explanatory power of the theory, we do not survey this research. For details, see Heath and Chatterjee 1995; Huber, Payne, and Puto 1982; Huber and Puto 1983; Ratneshwar, Shocker, and Stewart 1987; Sen 1998; Simonson and Tversky 1992; and Wedell 1991.

cluster frontier from brand y . In the case of asymmetric technological constraints (see Figure 8b), brand y may not end up as the closest brand to the frontier. Novice consumers are unlikely to be aware of technological constraints and, even in the presence of these constraints, the novice consumers are likely to use the cognitively simpler model presented in Figure 7. Experts, however, are likely to be aware of technological constraints and are more likely to use the model in Figure 8 (see Alba and Hutchinson 1987). As a result, symmetric constraints could augment the attraction effect for “expert consumers.” Conversely, asymmetric constraints could result in the preferred brand not being centered between the two extreme brands (see Sen 1998).

[Insert Figure 8 here]

c. Extremeness Aversion: the Polarization Effect

The second form of extremeness aversion is the asymmetric case of polarization in which adding brand x to the existing choice set of brands y and z increases the preference for y , however, adding brand z to the existing choice set of brands x and y does not increase the preference for y (see also Simonson 1989; Tversky and Simonson 1993). These differential effects have puzzled researchers using the context of price and quality.²⁴ First, it is possible that the consumers differentially view and weight price and quality, resulting in an asymmetric cluster frontier (as in Figure 8b). Such a construction of the cluster frontier is also possible in the presence of asymmetric technological constraints for a price-quality relationship (Grewal, Monroe, and Krishnan 1998; Parker 1995; Rao and Monroe 1989; Urbany et al 1997; Zeithaml 1988). As price increases, so do perceptions of quality, but at a decreasing rate, which results in an asymmetric cluster frontier (Dodds, Monroe, and Grewal 1991; Kalyanarum and Winer 1995; Tellis and Gaeth 1990). Therefore, it is possible that the effect may be heightened for novices in comparison to experts. Thus, perceptions about the relationship between price and quality may

²⁴ Simonson and Tversky (1992, p. 292) note, “We have no definite answer for this question.” Our framework offers two viable explanations.

result in differential context effects concerning the price-quality relationship (see also Lichtenstein and Burton 1989).

Second, in comparison to price, quality is more difficult to assess, resulting in a higher brand variance. Taken together with the ease in determining price, this results in asymmetric brand variances (Boulding and Kirmani 1993; Hoch and Deighton 1989; Simonson and Tversky 1992). Figure 9 shows this phenomenon for a two-brand (x and y) two-attribute (price and quality) product-market in which an entrant brand (z) affects consumers' desires for existing brands x and y . In Figure 9a, the solid dots represent the estimated brand positions, the hollow dot represents the perceived cluster frontier, and the rectangles indicate brand variance. The consumer is uncertain about the true prices and qualities of brands x and y , but believes that the true levels of these attributes lie within the rectangles.²⁵ In Figure 9a, the consumer perceives that brands x and y are equidistant from the perceived cluster frontier, therefore (by P_7) the consumer has, *ceteris paribus*, no clear preference for either brand. In Figure 9b, brand z has entered the market. Because brand z is positioned to the right of brand y on the quality attribute, it is, relative to the consumer's experience and knowledge, of unprecedented quality. The consumer will respond to this supposed unprecedented quality in one of three ways: (1) the consumer will accept the brand z 's quality claim as true, (2) the consumer will be suspect of brand z 's quality claim (i.e., the consumer will attach a larger brand variance to z than that attached to brands x and y), or (3) the consumer will become suspect of the quality claims for all brands (i.e., the consumer will attach larger brand variances to x , y , and z). The first and second responses are consistent with the compromise effect. The third response is consistent with the polarization effect.

²⁵ Although often there is zero uncertainty regarding price, for higher priced products (e.g. cars) price is partially uncertain. For example, despite a clearly delineated sticker price, because of hidden fees and the ability to negotiate, car buyers are never exactly sure of the price of a car until the sale is finalized.

In Figure 9b, the addition of brand z —a brand with a claim of unprecedented quality—causes the consumer to become suspect of the quality claims of all brands. This results in an increase in brand variances for all brands along the quality dimension. While the consumer does not know the true locations of the brands nor of the cluster frontier, the consumer perceives that the best possible scenario for x and y (i.e., positions in which brands x and y are located as close as possible to the cluster frontier) are shown in Figure 9b. The uncertainty concerning quality increases the possibility that the true location of brand x is actually quite close to the true location of the cluster frontier. Meanwhile, the increase in uncertainty did little to change the consumer's perception of the distance between brand y and the cluster frontier.

[Insert Figure 9 here]

11. Strategic Applications and the Link to Monopolistic Competition

Our framework suggests strategies for firms competing in monopolistic competition. For example, consider seven representative firms in a monopolistically competitive industry in which consumers perceive brands to be positioned according to two salient attributes: price and quality. As is shown in Figure 10, the product-market is separated into two clusters: a cluster of three (representative) brands that exhibit low quality but also low price, and a cluster of four (representative) brands that exhibit high quality but also high price.

Brand x 's manufacturer has several options for increasing demand for brand x .

1. Reposition the brand (Figure 10a). Brand x can improve the quality in an attempt to move closer to the cluster frontier.²⁶ According to P_7 , we can expect this strategy to increase the probability of choice-given-consideration for brand x while leaving the probability of

²⁶ This is the strategy American automobile manufacturers employed in response to foreign competition in the 1970's and 1980's.

consideration unchanged. In total, the manufacturer can expect to see an increase in the probability of choice for brand x .

2. Introduce a dominated brand (Figure 10b). Brand x 's manufacturer can introduce a new brand (brand y) that is positioned close to brand x but is dominated by brand x on both attributes.²⁷ According to P_4 , we can expect this strategy to increase the probability of consideration for all brands in the cluster while leaving the probability of choice-given-consideration unchanged.²⁸ In total, the manufacturer can expect to see an increase in the probability of choice (i.e. demand) for brand x .
3. Articulate a technological constraint (Figure 10c). Through advertising, brand x 's manufacturer can explain that a technological constraint restricts the price/quality tradeoff within the cluster.²⁹ According to P_7 , the technological constraint will increase the probability of choice-given-consideration for brand x while leaving the probability of consideration unchanged.

[Insert Figure 10 here]

Each of these strategies, potentially, will increase the probability of choice for brand x and, therefore, increase the demand for brand x . The increase in demand results in short-run economic profits until such time as competitors undermine or duplicate the strategy brand x employed.

This framework provides a link between traditional models of monopolistic competition and the consumer choice literature. In traditional models of monopolistic competition, short-run profit taking is explained as resulting from a shock (e.g. advertising, product innovation) that

²⁷ This is the strategy that the Miller Brewing Company employed in introducing its Red Dog brand. Market analysts claimed that Red Dog would simply siphon market share away from Miller's leading brand, Miller Lite. Instead, following the introduction of Red Dog, Miller Lite's market share increased.

²⁸ This assumes that the introduction of Red Dog does not increase the cluster variance. As Miller positioned Red Dog to be similar to Miller Lite, it is reasonable to assume that any impact on cluster variance was minimal. In fact, for the consumer who perceives Miller Lite to be positioned toward the center of the cluster, positioning Red Dog close to Miller Lite could have decreased the cluster variance thereby providing an additional boost to the probability of consideration for the cluster.

²⁹ Ben & Jerry's employed this strategy when they launched a series of ads suggesting that their ice-cream was high in calories, but pointing out that that was the tradeoff one made in obtaining quality taste in ice-cream.

increases the demand for one brand relative to another. In the long-run, either the shock wears off (e.g. consumers' memory of the ad fades) or the shock is duplicated for other firms (e.g. competitors duplicate the product innovation), resulting in a return to zero profits for all firms. This framework provides detail as to how the shocks can occur via perceived brand positioning. Following the Ben and Jerry's example above, advertising that causes consumers to believe in the existence of a technological constraint leads to an increase in demand for Ben and Jerry's and a decrease in demand for the competing brands within Ben & Jerry's cluster. For the short-run, Ben & Jerry's experiences economic profit while their competitors (within the cluster) experience economic loss. Interestingly, the model would predict no change in demand for brands outside Ben & Jerry's cluster. The alteration in relative demands would persist in the short-run until either (a) consumers, via consumption experience or garnering more information about heretofore unknown brands, determine that the technological constraint is unreal, or (b) competing brands reposition themselves closer to the (new) cluster frontier (either via actual changes in their attributes or advertising aimed at altering consumers' beliefs about their attributes). Thus, in the long-run, we can expect demand for Ben & Jerry's to fall (relative to their competitors), and demand for the other cluster competitors to rise (relative to Ben & Jerry's).

[Insert Figure 11 here]

12. Conclusion

In this paper, we draw on more than twenty years of theoretical and empirical literature on consumer behavior and context effects to suggest a theoretical framework for modeling strategic behavior in monopolistically competitive industries. We define five characteristics of product-

markets that can serve as heuristics in the choice process, and show that these heuristics impact the consumer's probabilities of consideration and choice-given-consideration for brands in the product-market. Finally, we postulate that consumers will use experiences garnered from their consumption decisions to attenuate external and internal uncertainties, thereby causing their perceived product-markets to evolve iteratively.

The framework opens the door to a broader application of context effects. For example, there is much economic literature on voter preferences that would benefit from application of context effects in which political candidates are seen as competing brands with different attributes. A possible counter-intuitive result from this research (along the lines of the attraction effect) would be that some candidates could benefit more by donating to a competitor's campaign than by increasing their own campaign efforts. For example, when a candidate is well-known, contributing a fixed amount of dollars to the campaign of a lesser known, though similar (i.e. within the same cluster) competitor, could increase the probability of consideration for the candidate by more than would spending those same dollars on the candidate's own campaign. The argument here is that the elasticity of the probability of consideration (i.e. the relative change in the probability of consideration given a change in campaign spending) for the candidate is greater than the elasticity of the probability of choice-given-consideration. Another possibly counter-intuitive result from this research (along the lines of tradeoff contrast) is that some candidates could benefit from being specific about their positions on topics while others might benefit from being deliberately unclear because one candidate's lack of clarity might push the cluster frontier farther away from all candidates such that, while the probability of choice-given-consideration falls for all, the probability might increase for some relative to others.

Another intriguing application is in the realm of stock price analysis where stocks can be viewed as brands with salient attributes of price, risk, and various financial measures. Interestingly, the dot-com market bubble can be modeled as an increase in the number of brands in the technology cluster. Our model predicts that an increase in the number of tech stocks would increase the probability of consideration for all stocks in the tech cluster.

The framework provides a background for further research into the implications of risk-preference on consumer choice. Consumers who are risk preferential may exhibit behavior that violates some of the framework's propositions. For example, a risk preferential consumer may exhibit a greater probability of consideration for smaller rather than larger clusters. Also, a risk averse consumer may exhibit a greater probability of choice-given-consideration for brands with low variance even if they are positioned further away from the cluster frontier than other brands with higher variances.

Lastly, the framework and referenced empirical work suggest that some utility models would benefit from explicitly accounting for uncertainties with regard to product attributes (i.e. brand variance) and uncertainties with regard to mental clustering of brands (i.e. cluster variance). In the presence of non-extreme consumer involvement and many competing brands, treating utility as determinate may lead to incorrect conclusions as uncertainty and the consumer's response to uncertainty, vis-à-vis the consideration-choice process, play significant roles. Further, the framework suggests that utility maximization might be considered as an on-going, stochastic, adaptive process in which consumers use evidence gleaned from past consumption to mitigate uncertainty and refine heuristics for use in future consumption decisions.

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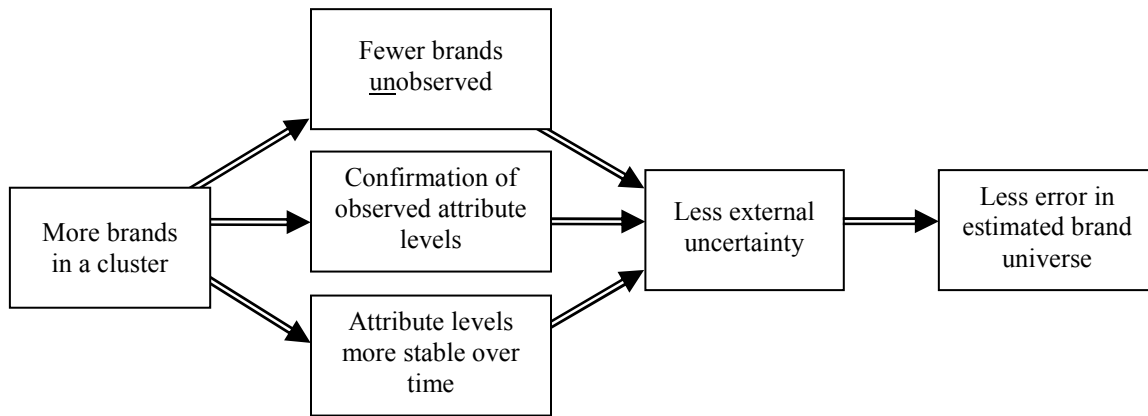
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FIGURE 1

Larger Cluster Size Implies Less *External* Uncertainty



Larger cluster size implies less *internal* uncertainty

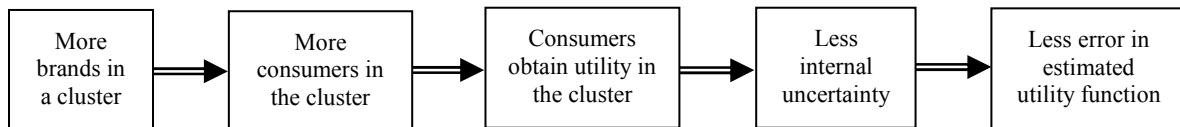
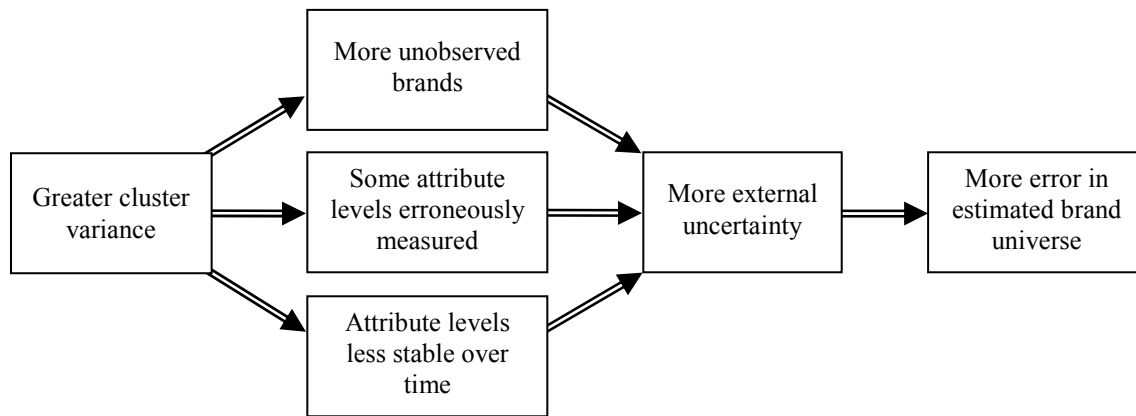


FIGURE 2

Larger cluster variance implies more *external* uncertainty



Larger cluster variance implies more *internal* uncertainty

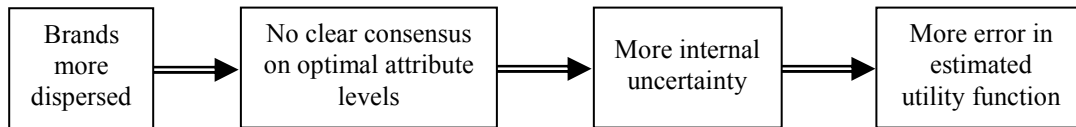


FIGURE 3

Brand Extrapolation and Cluster Frontier

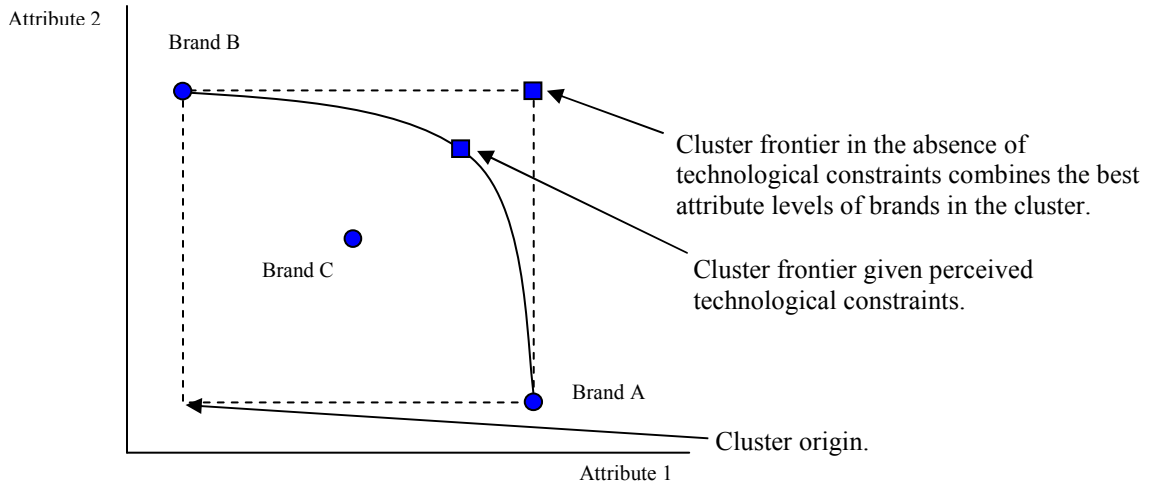


FIGURE 4

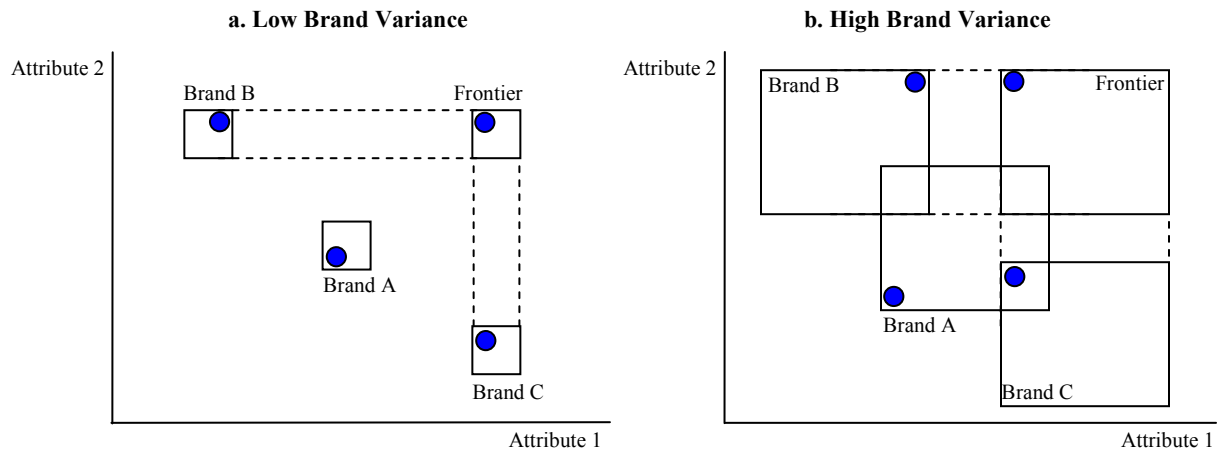


FIGURE 5

The Iterative Choice Process, Uncertainty, and Perceived Product-Market Characteristics

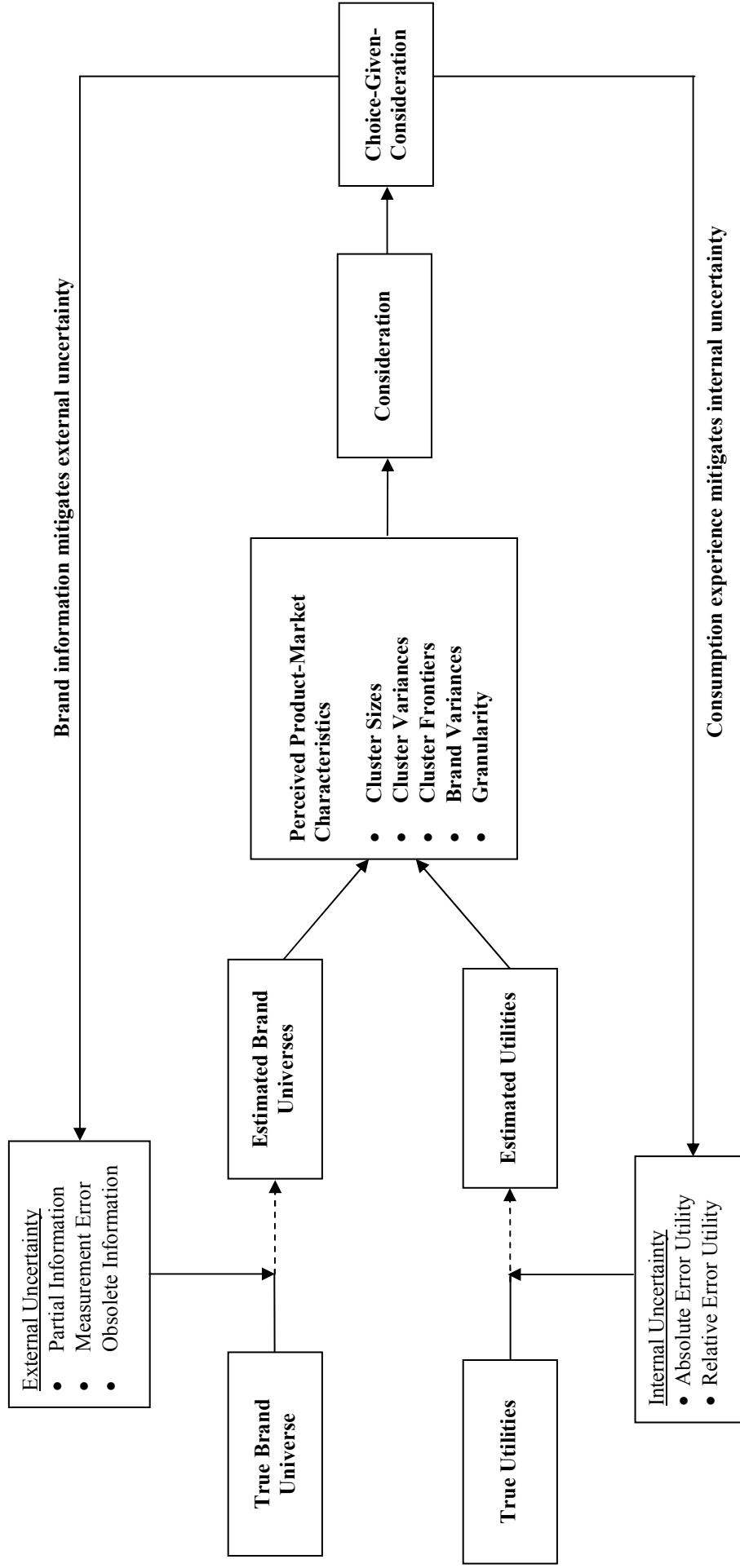
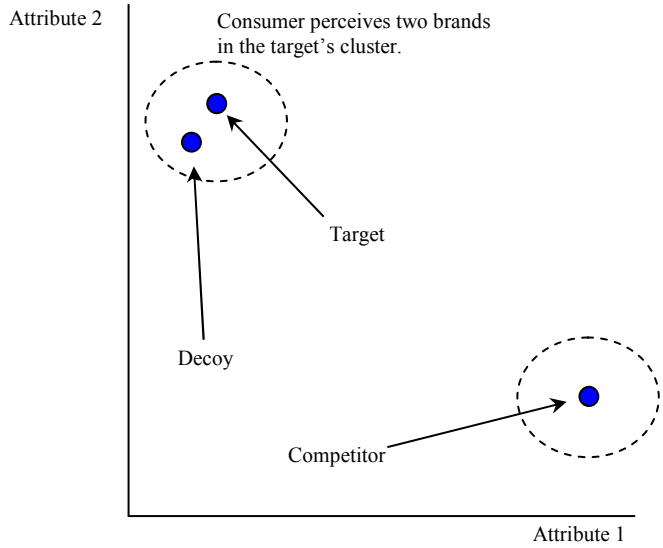


FIGURE 6

a. The Attraction Effect (Zero Brand Variance)



According to P_4 , the decoy increases the number of brands in the target's cluster and so increases the probability of consideration for the target brand.

According to P_7 , because the decoy has not increased the distance between the target brand and the target brand's cluster frontier, the probability of choice-given-consideration has not changed for the target brand.

b. Proportionality

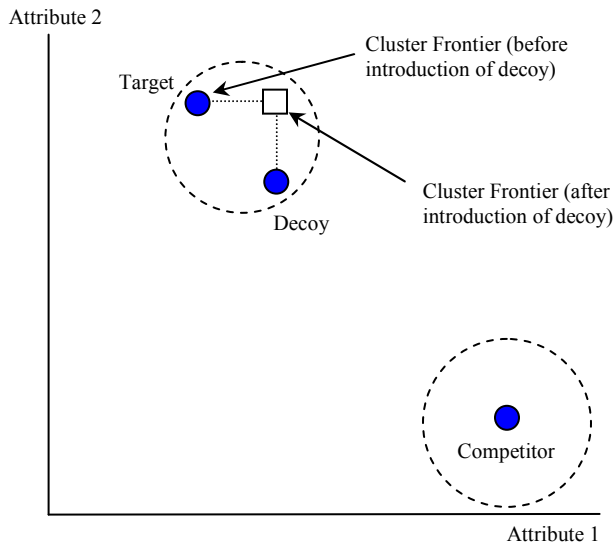
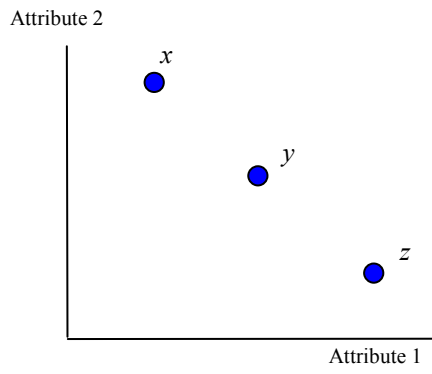


FIGURE 7

a. The Compromise Effect



b. Brand Extrapolation

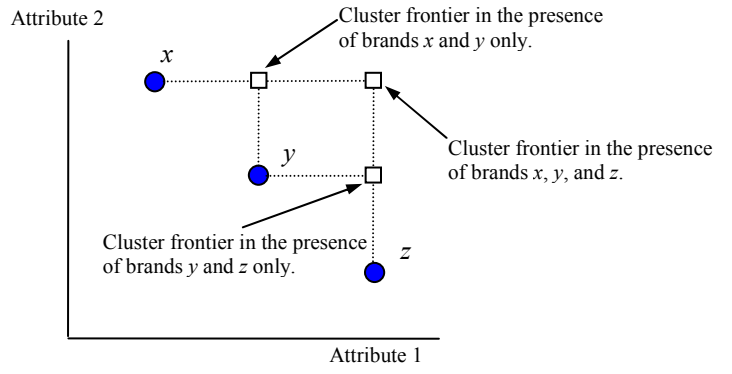
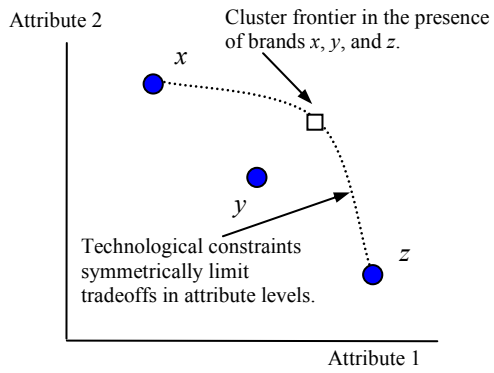


FIGURE 8

a. Symmetrical Technological Constraints



b. Asymmetrical Technological Constraints

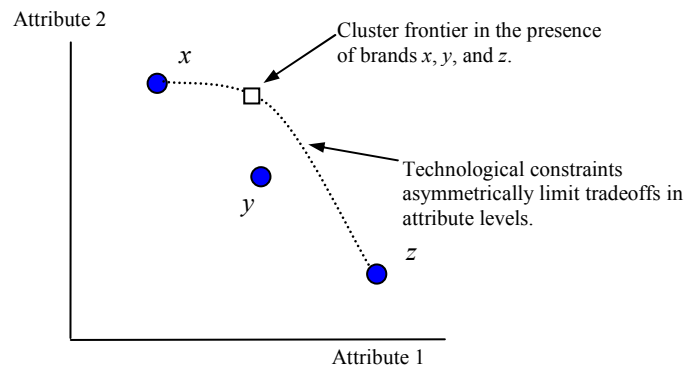
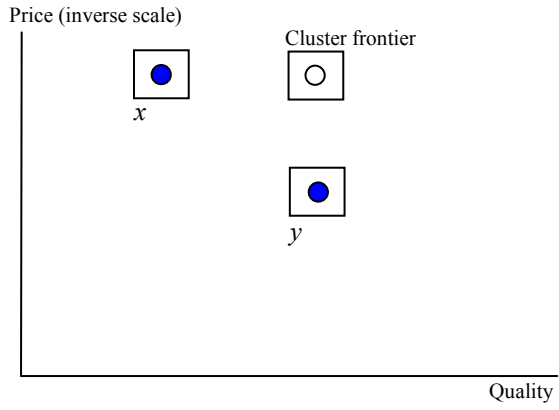


FIGURE 9

a. Two brand market



b. The Polarization Effect

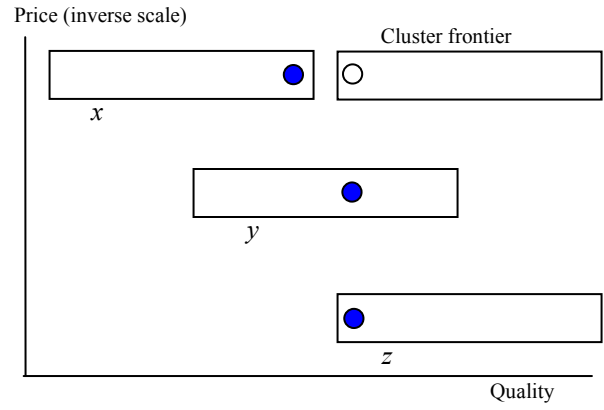
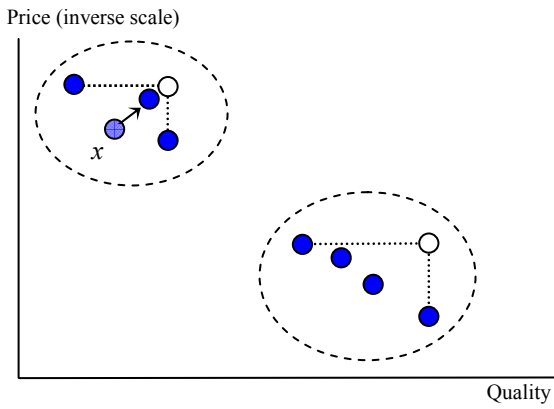
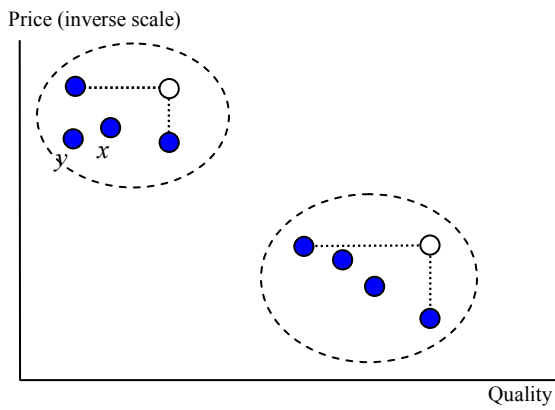


FIGURE 10

a. Increasing Brand Demand by Repositioning Closer to the Cluster Frontier



b. Increasing Brand Demand by Introducing a Dominated Brand



c. Increasing Brand Demand by Articulating a Technological Constraint

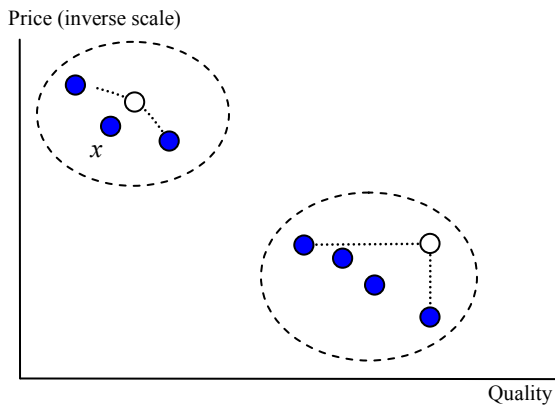


FIGURE 11

Impact of Brand Positioning on Demand

