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This research develops a taxonomy of alphanumeric brand names (ABs) based on the alignment between the brand names and their links to products and attributes. Five empirical studies reveal that ABs have systematic effects on consumers' product choices, moderated by consumers' need for cognition, the availability of product attribute information, and the taxonomic category of the AB. In an identical choice set, the choice share of a product option whose brand name takes a higher versus lower numeric portion (e.g., X-200 versus X-100) increases, and it is preferred more even when it is objectively inferior to other choice alternatives. Consumers with low need for cognition use "the higher, the better" heuristic to select options labeled with ABs and choose brands with higher numeric portions. Consumers with high need for cognition process ABs more systematically and make inferences about attribute values based on brand name–attribute correlations. The effects of ABs on consumer preferences are prevalent for most technical products, even when consumers do not know the product category or meanings of attributes.

Keywords: alphanumeric brand name, branding strategy, missing information, inference making, brand name heuristic, missing attribute, choice, preference

How and When Alphanumeric Brand Names Affect Consumer Preferences

Alphanumeric brand names (ABs) include a mix of letters and numbers (Pavia and Costa 1993). Examples include 7UP soft drinks, the 3M Corporation, and the Pentium IV computer chip. There are literally millions of registered and unregistered alphanumeric trademarks in use (U.S. Patent and Trademark Office 2006). The spread of technology, the increased use of market segmentation, the difficulty of finding and implementing brand names, the decrease in product life cycles, and the tendency to extend a favorable brand name to new product categories have all led marketers to increase their use of ABs (Boyd 1985). However, despite this widespread use of ABs, little is known about how they actually affect consumer choice.

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Most prior studies have focused on the linguistic properties of ABs and their association with different product categories. In their benchmark study, Pavia and Costa (1993) investigate how consumers react to the magnitude of the numbers and the symbolisms of the letter combinations used in ABs. They find that the numbers in brand names play a vital role in determining consumers' perceptions of the product and its relative newness, whereas the letters usually help them identify the product type. In another study, Ang (1997) finds that various phonetic features of ABs, such as the inclusion of lucky numbers and favorable letters, can have important effects on consumers' general product opinions. King and Janiszewski (2009) show that when the numeric portions of ABs were equal to products of numbers (e.g., Axe16, where $16 = 2 \times 8$ or 4×4) rather than prime numbers (e.g., Axe17), they generated better affective responses from consumers.

Although prior studies have provided important insights about the perceptions of ABs and their uses in various product categories, the effects of these brand names on consumer choice have not been explored. The purpose of this research is to identify the systematic effects of ABs on con-

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sumers' preferences under different circumstances. Building on previous findings, we demonstrate how and when ABs affect consumers' purchase decisions in the marketplace. Our investigation primarily focuses on preferences for different alphanumeric models of parent brands (e.g., Canon S500 versus A600). We examine the effects of ABs in situations in which there is both complete and incomplete attribute information and explore the decision processes adopted by consumers who have high versus low need for cognition.

We begin by developing a taxonomy of ABs based on the alignment of brand names and their links with products and attributes. Then, we report five empirical studies that examine the systematic effects of these brands on choices of different products. In these studies, we first consider the effects of higher versus lower numeric portions of the brand name that align with attribute values. We next examine various moderators, including the consumer's need for cognition, product category (novelty), the absence of attribute information, and whether consumers make inferences about this information. The combined results reveal that low-need-for-cognition consumers (LNCs) use "the higher, the better" brand name heuristic in earlier decision-making stages, and regardless of attribute values, they assume that higher-level brands correspond to better products. In contrast, high-need-for-cognition consumers (HNCs) process brands more deeply to understand and infer brand–attribute correlations. When there is missing attribute information, LNCs tend to choose higher-level brands, even if better products are labeled with lower-level brands or attributes are completely unknown. Making inferences about missing attributes boosts the effect of ABs on choices among most products, and inferences made by HNCs tend to be related to the ABs.

CONCEPTUAL FRAMEWORK

Boyd (1985) explains that regular brands commonly use numbers to build complex ABs that give "character" to products. Although ABs tend to be subbrands, they are much more explicit than any parent brand names in defining the products they represent. For example, an A8 car brand refers to a more specific product than Audi (for other examples, see Pavia and Costa 1993). In the early days of the automotive industry, Ford sued the Model E Corporation because its name was too similar to Ford's Model T cars and Model E brand trucks (Connely 2000). More recently, Nissan and Audi have struggled over the letter "Q" because of the resemblance between the Audi Q7 and Nissan Infinity Q45 brands. Similarly, there have been legal actions involving the Nissan Z cars and the BMW Z4 and among the Nissan M35, Mercedes ML350, and BMW M3 (Webster 2005).

It is more important to find out about what consumers actually think about ABs. Yahoo! Answers, an extremely popular Web site with more than 120 million users worldwide (Leibenluft 2007; see Web Appendix A at http://www.marketingpower.com/ jmrdec10), is one of the largest consumer blog sites, where consumers post product-related questions and receive replies from fellow consumers. Among other things, this site contains millions of questions about thousands of different ABs in the marketplace. It is a useful resource for understanding consumers' concerns about and perspectives on brands. We examined a set of 100 questions focused on BMW's ABs. Our examination indicated that consumers are often confused about the meaning of ABs and how the brands relate to product attributes. Some sample questions about BMW included the following:

- Which one has a better engine, BMW 5.25i or 6.50?
- What's the difference between BMW models? What do all the numbers mean 5.25i, 3.28?
- Difference between the BMW 6.50i and 6.45i? Which number is the horsepower, if any?
- What is the *difference* between the BMWs E39 ///M5 v8 and the E92 ///M3 v8?
- What does M6 *stand* for as in *B*M*W* M6? What does xi in BMW 525xi refer to?

Overall, we identified three major types of inquiries:

1. Comparisons among products labeled with ABs (i.e., "Which brand is superior to the other?"),
2. The relationship between an AB and the brand's attribute values (i.e., "Which attributes do brand names refer to and how?"), and
3. The rationale or meaning of the AB alignment (i.e., "What is the rule used for branding or the logic of the order followed by the brand names?").

These inquiries are consistent with those derived in Pavia and Costa's (1993) study, in which focus group participants suspected that the number portions of ABs had something to do with feature measurements or signified the product's relative placement in a sequence of brands. Boyd (1985) classifies ABs according to their main functions: abbreviations (e.g., LN7 for Lincoln, DL for deluxe), extensions of new models (Audi A3–A8), direct symbolism referring to physical product attributes (the v-shaped V8 engine), technical symbolism to incorporate some technical attribute (AMD64 chips use 64-bit processors), or inventory codes or internal design numbers (usually unknown to consumers). By integrating Pavia and Costa's findings with Boyd's functional classification and our observations, we develop a taxonomy of ABs.

A TAXONOMY OF ABs

On the basis of our investigation of limited previous research on ABs and consumer queries, we propose a categorization of ABs according to two dimensions. These dimensions are (1) how the increase or decrease in the numeric portions of brand names aligns with some product aspect and (2) how the brand name links with the brand's attribute values and/or the overall product.

Alignability

Alignability refers to whether differences in attributes or characteristics are comparable. If the difference is comparable, the characteristic is alignable; if not, the characteristic is nonalignable. Alignable attributes tend to be more quantitative and monotonic and are weighted more heavily in judgments (Markman and Medin 1995). In general, brand names are not alignable because of their qualitative nature (e.g., Ford Mustang, Focus). However, alphanumeric brands are semiquantitative and therefore are comparable extrinsic attributes (e.g., BMW 3.25, 3.28, and so on). They include numbers, and when there are multiple brands in a category, they usually follow an alignable sequence.

Alphanumeric brand names are generally monotonically increasing or decreasing, though more rarely, they may be nonmonotonic. Consumers have different perceptions about

the trends followed by ABs. Pavia and Costa (1993) report that participants in a focus group study attended to the scale of numeric portions of ABs and generally favored higher numbers in brands, with the inference that they represented more superior products or more recent models. In contrast, for luxury or hedonic products, such as cosmetics, some participants regarded ABs with lower numbers as better because they cued uniqueness (e.g., CK One brand perfume by Calvin Klein). Nonmonotonicity is a third possibility, such that the AB either does not increase or decreases monotonically, and consumers' preferences do not move in parallel with the AB trend. For example, when ABs refer to design codes in clothing (e.g., Levi's 501, 505), consumers do not necessarily prefer higher- or lower-level brands but choose among these nontechnical products according to their preferences or needs.

Therefore, our primary classification is the alignability of ABs with the attribute values or overall product. We define three groups: (1) aligned-ascending brand names that follow a monotonically increasing sequence linked to the overall product and/or its attribute values, (2) aligned-descending brand names that follow a monotonically descending sequence, and (3) nonaligned brand names that comprise truly nonmonotonic brand names and monotonic brand names for which consumer preferences do not follow monotonicity. Table 1 provides examples of different types of ABs.

Link with Overall Product Versus Specific Attributes

Another important feature of ABs is that the brand name links to one or more specific attributes, the overall product, or nothing. Sometimes ABs make it fairly easy to draw inferences about the product. Certain ABs cue general product quality or improvements; Pentium IV processors are more advanced than Pentium III processors. Others cue certain attributes; AMD32 chips have 32 bits compared with the AMD64's 64-bit processing (see Table 1). In such situations, ABs may help consumers choose, even in unfamiliar product categories.

Yet it is not always easy to understand what ABs mean, because they may not be linked to the product in an obvious way. Consumers' expectations about the link between brands and product attributes or overall product quality also may not be congruent with marketers' brand naming strategies. For example, a Canon A530 is not clearly superior to an A460 digital camera. Similarly, Nokia cell phones do not necessarily get better as the brand number increases. For the average consumer, it is difficult, if not impossible, to figure out what some of the brands actually refer to, and companies are not obligated to communicate such information.

Unfortunately, the lack of an obligation to structure the meaning of ABs creates an opportunity for marketers to misdirect consumers. Planey and Earle (1996) warn that standard business computer monitors of the time had 13 inches of actual viewing area, though some producers were using the number 14 in their ABs to suggest a larger, 14-inch screen size. Consumers might have been misdirected by these ABs because they were unlikely to have measured the screen or read through manuals or catalogs to learn the product's exact specifications. Companies that employ such confusing or potentially misleading sequencing information cannot be accused of intentionally misleading customers,

Table 1
TAXONOMY OF ABs

	Linked (to Specific Product Attributes)	*Nonlinked (to Specific Attributes or Linked to Overall Product)*
Aligned Brand Names		
Aligned-ascending ("the higher, the better")	*Technical Symbolism* •AMD32 versus AMD64 chips (32 bit versus 64 bit processing) •BMW 3.28 versus 3.35 (2800cc versus 3500cc engine)	*Product Extensions* •Boeing 737, 747 •Audi A3, A4, A6, A8 (overall series) *Recency in a Series:* •Pentium 2, 3, 5 •Play Station 1, 2, 3 *Date of Release* •Windows 95, 97, 2000 •TurboTax 2005, 2007
Aligned-descending ("the lower, the better")	*Undesired Attributes* •Nickles 35 breads (35 calories) •GE Genura 23, 55 Lamps (23 or 55 watts consumption)	*Mythical Numbering* •Calvin Klein One perfume (cues uniqueness)
Nonaligned Brand Names		
Nonmonotonic (not necessarily increasing or decreasing)	*Direct Symbolism* •Xbox 360 (360° game view) *Abbreviations* •V8 juice (contains eight vegetables)	*Abbreviations* •3M (Minnesota Mining and Manufacturing) •WD-40 (40th formula of Water Displacement) *Direct Symbolism* •7-Eleven (open 7:00–11:00) *Mythical Numbering* •No. 7 cosmetics (lucky #7) •Cerruti 1881 perfume
Monotonic (neither higher nor lower level brands preferred)	*Preference Depends on Needs* •Coppertone 30, 40, 50 (sun protection factor)	*Design Codes* •Levi's 501, 505, 607 (different cuts) *Inventory Codes/Internal References* •Panasonic TH-50PZ85U (firm-specific, expert users may know)

because ABs do not need to refer to better attributes or improved product series. They can simply refer to internal codes, assigned at the sole discretion of the firm (Boyd 1985). Some consumer Web sites, such as epinions.com, notify shoppers about the potential misleading effects of ABs (see Web Appendix A at http://www.marketingpower.com/jmrdec10).

Table 1 provides a taxonomy of ABs based on these two dimensions. In line with prior studies, most ABs fall into the aligned-ascending and monotonically increasing, or "the higher, the better," category. In our investigation of Yahoo! Answers, we also observed that the vast majority of questions about ABs pertained to technical products. Similarly, Pavia and Costa (1993) report that their respondents exhibited a stronger preference for ABs in more technical, complex, and functional product domains and therefore identify these domains as more appropriate for AB use. In contrast, ABs seem less appropriate for sensual, fun, or luxury products, which often exhibit nonaligned or aligned-descending ABs (see Table 2). The focus of our investigation is on the more universally used, aligned-ascending brand names that refer to technical products and generally follow "the higher, the better" logic. However, we also examine aligned-descending brand names, nonaligned brand names, and ABs for nontechnical products.

THE EFFECTS OF ABs ON CONSUMER CHOICE

Although previous studies have provided some evidence that the numeric portions of ABs affect consumers' perceptions, no research has investigated the effects of ABs on consumers' choices. Accordingly, we examine how labeling products with higher- or lower-level ABs affects consumer preferences. Our taxonomy suggests that when consumers prefer higher attribute values (e.g., faster speed), they choose options with aligned, higher numbered brands, perhaps even when they do not see a clear link between the attribute values and the brand name. For example, Pavia and Costa (1993, p. 89) quote a focus group participant who indicated the following:

> I think they had like an Audi 5000, was it? And then they came out with a new line of car, and they took a number off; they went down to, what was it, 100?... To me, that, without looking at the new car, it seemed like a lesser product. Until they proved to me that it was a better product;… another example is Saab. I mean they went from 900 to 9000, and you just expected a better car.

Table 2
FOCUS GROUP PARTICIPANTS' PERCEPTIONS OF USES FOR ABs

	Appropriate Uses for ABs	*Inappropriate Uses for ABs*
Cars	•Sports cars •High-performance cars •Luxury cars that emphasize performance (e.g., Mercedes)	•Luxury cars that emphasize comfort (e.g., Cadillac)
Clothes	•Work clothes •Sports clothes •Neon-colored clothes	•Lingerie •Fur coats •Baby clothes
Furniture	•Office furniture •Contemporary/ futuristic styles	•Bedroom furniture •Traditional styles
Generalizations, not absolute rules, made by the focus groups	•Functional products •Complex products •Technical products •Modern products	•Fun products •Sensual products •Simple products •Nontechnical products •Traditional products

Source: Pavia and Costa (1993, Table 2).

Four research streams in cognitive information processing suggest that consumers have a natural preference for higher-level ABs. First, "the higher, the better" heuristic is a common phenomenon in numerical processing because many well-known scales, including credit scores, intelligence quotients, and financial compensations, make higher numbers preferable. Second, studies on the spatial representation of numbers repeatedly show that people automatically use visual-spatial imagery to represent the magnitude of numbers as increasing from left to right or bottom to top (see Fias and Fisher 2005). According to this logic, when respondents compare, for example, the numbers 2 and 5, they mentally represent the higher number as above the lower number (Cooper 1984). Evidence suggests that this assignment is not arbitrary but rather is a natural way of associating higher numbers with higher levels and better objects, even when the objects are unrelated to the numbers. For example, when a certain color is labeled with a larger number, it is perceived as superior to another color labeled with a smaller number (Fias and Fischer 2005; Simon 1969).

Third, studies on the metaphorical structures of human conceptual systems reveal that people use well-established orientation metaphors, such as "more is up" or "good is up," that suggest an intuitive preference for higher numbers in almost every aspect of life. This natural and cultural association of higher numbers with better things is based on humans' interactions with their environment, society, and physical space (Lakoff and Johnson 1980). Fourth, in parallel with cognitive psychology literature, studies in marketing document several similar rules that consumers commonly adopt in their decision-making processes. For example, the price–quality literature demonstrates that, in general, many consumers adhere to a logic in which the higher the price of a product, the higher is the perceived quality (Oxoby and Finnigan 2007). In line with previous literature, we hypothesize that a similar logic holds for ABs.

H_1: In an identical choice set, when a product option has an alphanumeric brand with a higher (versus lower) numeric portion, it achieves a larger choice share.

BRAND NAME HEURISTIC OR BRAND–ATTRIBUTE RELATIONSHIPS

Because sellers almost never describe products in complete detail, consumers often must make inferences using whatever information about product options is available (Gunasti and Ross 2009; Kardes, Posavac, and Cronley 2004; Simmons and Lynch 1991). When consumers face choice uncertainty, they tend to make inferences that favor the options that are superior on features that align across all

options (Kivetz and Simonson 2000). In most choice contexts, a brand name is available for all options, even if no other information is available, and in the case of ABs, the brand name is generally alignable. Therefore, ABs should affect choices.

Richardson, Dick, and Jain (1994) find that extrinsic attributes that do not affect a product's physical features, such as brand names, tend to have a greater impact on consumer choice than intrinsic attributes that directly affect the product, such as color or size. Yorkston and Menon (2004) show that even the phonetic properties of unknown brands influence consumer judgments. Consumers use brand name as a quality cue, a phenomenon known as the brand name heuristic (Maheswaran, Mackie, and Chaiken 1992). Therefore, an important question is how consumers make use of ABs during their purchases and what individual characteristics may affect their use of these brand names. We contend that cognition-related personality variables play a role.

Prior research has shown that people with high and low need for cognition (HNCs and LNCs) tend to follow different routes when dealing with cognitive information (Cacciopo and Petty 1982). Whereas LNCs use heuristic processing that requires less cognitive work, HNCs engage in more systematic processing and pay more attention to all types of information. Therefore, HNCs and LNCs should process ABs differently. Pavia and Costa (1993) report that some focus group respondents already had a prevalent theory (intuition) that ABs (extrinsic attribute) were related to particular technical attributes (intrinsic attributes), whereas other respondents used the simpler heuristic that higher-level brand names referred to better products.

We propose that LNCs are more likely to use the brand name heuristic and draw on ABs in more naive ways. As Maheswaran, Mackie, and Chaiken (1992) suggest, consumers use brand name heuristics more extensively when they have low motivation or ability to process. Alternatively, HNCs are more likely to use the former type of processing—that is, to examine possible associations between brand names and attributes. At least a moderate level of cognition is required for correlation-based inference formation, and increased cognitive ability and motivation are associated with a higher likelihood of spontaneous inference formation (Kardes, Posavac, and Cronley 2004; Lee and Olshavsky 1997). When a within-attribute comparison is difficult, HNCs are more likely to process missing attributes and assess their values using other available attributes (Kivetz and Simonson 2000).

Keller (1993) argues that brand name inferences are based on perceived correlations between product attributes and brand names. Because HNCs demonstrate greater information acquisition and deeper levels of processing, they should be more likely to integrate available information, including brand names and attributes. Therefore, they will be more likely to discover relationships and inconsistencies between brand names and attribute information. For example, if an X-200 brand personal computer (PC) has a 200 GB hard disk and the hard disk size for an X-100 is not available, HNCs are likely to infer that the latter computer has 100 GBs. However, they are unlikely to assume that an X-2500 brand PC has an unrealistically large 2500 GB hard disk. In turn, they are less likely to assume that the X-2500 is better than the X-200 simply because it is a higher AB, especially if there is another aligned attribute (e.g., the X-200 has a processing speed of 200 milliseconds versus 2500 milliseconds for the X-2500). As consumers' need for cognition increases, they process more information and are less likely to follow the AB as a simple heuristic. Instead, they pay attention to all available information. In summary, we propose that HNCs and LNCs use ABs through different processes:

H_2: LNCs (versus HNCs) are more likely to use the brand name heuristic and follow the magnitude of ABs when choosing among ABs.

H_3: HNCs (versus LNCs) are more likely to infer missing attribute values from ABs and to identify brand–attribute relationships when making decisions with missing information.

H_4: LNCs (versus HNCs) are more likely to rely on the sequences of ABs during earlier decision-making stages.

H_5: ABs are more likely to affect choices among technical (versus nontechnical) products, even if the product category and attribute types are unknown to consumers.

STUDY 1: THE HIGHER, THE BETTER?

Study 1 investigated the effects of ABs on consumer choice among choice sets in which higher attribute values were more attractive. Fifty-one undergraduate students (participating in exchange for extra credit) chose one of two options for digital cameras and copy machines. These product categories have aligned-ascending ABs (as in Table 1) and several relatively equally important, quantitative, and comparable attributes.

The camera options had two attributes, and the copy machine options had three attributes, to avoid any confounding effects of choice complexity. We pretested to ensure that respondents would prefer higher values for all attributes and that there was some relationship between the alignment of brand names and at least one of the attributes. The choice options were designed such that no option clearly dominated; each was superior on one attribute and inferior on another (see Appendix A). Participants were informed that all other attributes, including prices, were identical. We used real brands with fictitious, realistic alphanumeric subbrand names to increase realism. To avoid confounding effects of competition among parent brands and minimize the effect of brand attitudes, the choice sets consisted of different alphanumeric subbrand names of the same brand (e.g., Canon DC-700MX versus DC-800MX).

We used a simple design of one factor (brand name order) with two levels: the low–high, for which Option 1 had the lower-level brand name and Option 2 was higher, and the high–low, for which the order was reversed. As we show in Appendix A, we set the choice sets such that the brand–attribute relationships were equally balanced when the brand name labels were reversed. For example, copier 1, labeled CR-P20, printed 22 pages per minute (ppm), whereas copier 2, labeled CR-P30, printed 31 ppm. When the brand order was reversed in the high–low condition, copier 1 was still labeled CR-P20 but stored 1995 sheets, whereas copier 2, still labeled CR-P30, stored 2995 sheets. It was important that both brand name order conditions were aligned with one of the attributes, which isolated the examination to the effect of the brand names rather than confounding the brand names and their relationships to the

attributes. The choice between the two options served as the dependent variable.

We conducted a logistic regression analysis for each product with brand name order (high–low versus low–high) as the independent variable and the binary choice (Option 1 = 1; Option 2 = 0) as the dependent variable. The overall models were significant for both products (both $\chi^2 > 5.8$, $p < .05$). When camera Option 1 was labeled with a higher- (versus lower-) level brand name, its choice share was significantly higher (M = 64% versus 31%; b = 1.38, Wald $\chi^2 = 5.43$, $p < .05$). As Figure 1 shows, when copier 1 had a higher-level brand name, its choice probability was significantly higher (M = 55% versus 23%; b = 1.45, Wald $\chi^2 = 5.51$, $p < .05$).

This study provides a simple demonstration that ABs can affect consumer choice. For the choice set, an identical product option labeled with a higher-level AB achieved a higher choice probability. These results for an aligned-ascending AB show that consumers followed "the higher, the better" logic when we used attributes for which consumers preferred higher values. However, for other attributes, consumers should prefer lower values (e.g., calories, loan interest rate). In such aligned-descending cases, are consumers more likely to choose lower level brands corresponding to lower attribute values? Because aligned-descending branding is less common and Pavia and Costa's (1993) respondents did not refer to such uses of ABs, we expect that "the lower, the better" heuristic is less prevalent than "the higher, the better" heuristic. To test whether consumers chose lower-level brands, we conducted Study 2 with aligned-descending AB.

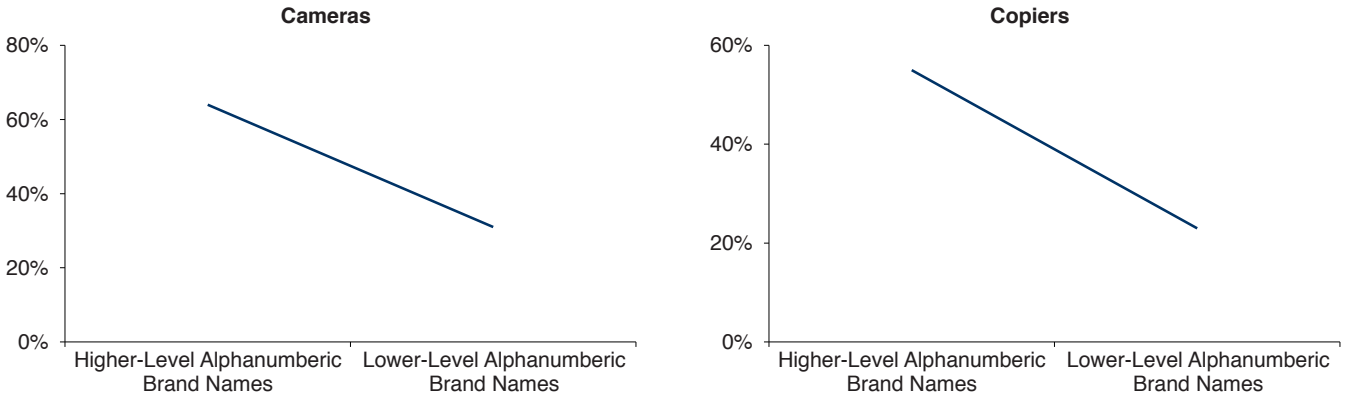
STUDY 2: THE LOWER, THE BETTER?

Sixty undergraduate students participated in Study 2 for extra course credit. The procedure and measures were identical to those of Study 1 except that we used different products: air purifiers, laser printers, and cell phones. Pretests showed that these products had several equally important

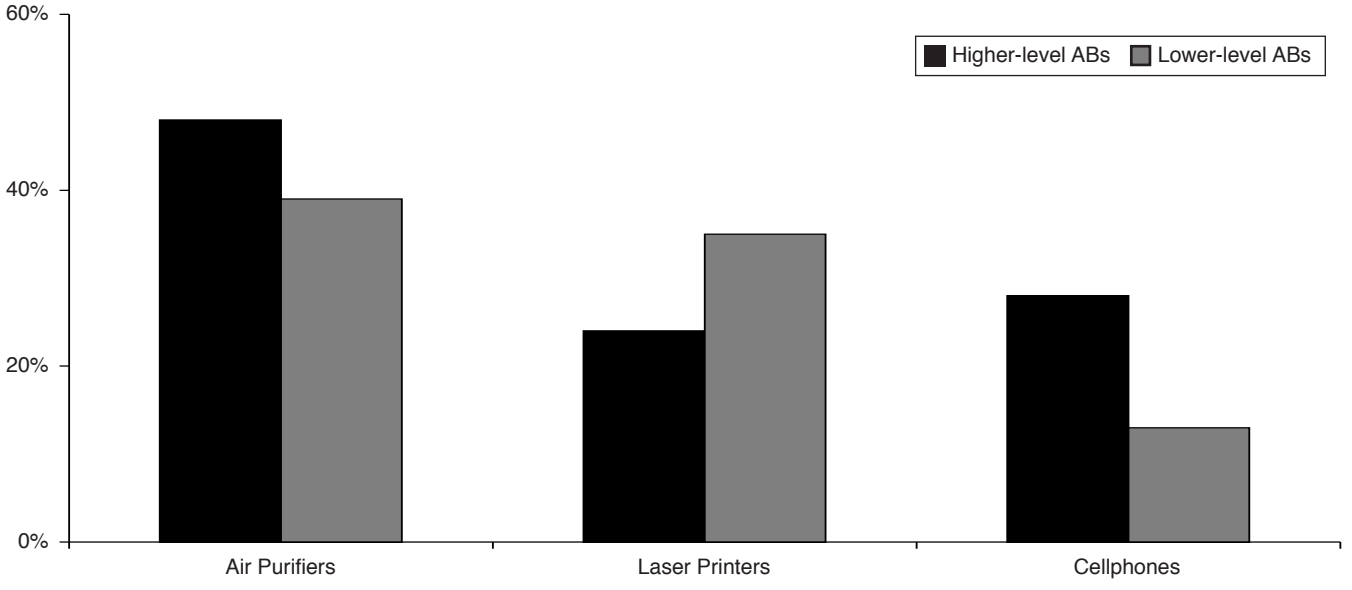
Figure 1

CHOICES OF OPTION 1 WHEN LABELED WITH HIGHER- VERSUS LOWER-LEVEL ABs

A: Study 1: Aligned-Ascending ABs: Test of "The Higher, the Better" Rule



B: Study 2: Aligned-Descending ABs: Test of "The Lower, the Better" Rule



comparable, quantitative attributes for which lower values were preferable. Respondents chose between two options for each product category, with the options labeled as aligned-descending ABs, as we show in Appendix A. As in Study 1, there were two AB branding conditions (low–high and high–low). We focused on whether the choice of Option 1 increased when it featured an AB with lower numeric portions.

Results

In a logistic regression conducted for each product, the independent variable was brand name order (high versus low or low versus high), and the dependent variable was the choice (Option 1 = 1; Option 2 = 0). The overall model was not significant for any products (purifiers: $\chi^2(1) = .56$; printers: $\chi^2(1) = .93$; cell phones: $\chi^2(1) = 2.0$; all *p*s >.1). Labeling Option 1 with a lower-level AB did not significantly increase its choice for any product (see Figure 1).

Discussion

Study 2's results show that there was no preference for lower-level ABs, even though the lower values were preferred in the pretest for all attributes and the ABs were clearly linked to attribute values. If there were any effect of ABs on choices in this situation, we would have observed an increased choice share for Option 1 when it featured the lower level AB. The lack of such a pattern implies that "the lower, the better" rule is not as prevalent as "the higher, the better" heuristic we observed in Study 1. We interpret the null results with caution, but tests with three different categories established the nonexistence of "the lower, the better" logic.

Studies 1 and 2 delineate the nature of AB effects on consumer choice. However, as does any study, they had limitations. The change in choices achieved by ABs was a preference shift rather than an irrational decision or normative violation. In addition, the choices did not have real consequences for the participants. To remedy these concerns, we conducted Study 3, in which we increased the salience of product options and the consequences for the participants.

STUDY 3: ROBUSTNESS OF "THE HIGHER, THE BETTER" HEURISTIC

The purpose of Study 3 was to test the effects of ABs on choices with real-life consequences for the respondents. Using nonquantitative, directly observable attributes, we also increased the visibility of the consumption outcomes. Seventy-four students completed an unrelated survey and were told that in return for their participation, they would be entered in a drawing to win a printer. They were then exposed to detailed output samples for various printer options and chose which printer to receive if they won.

The design consisted of the three conditions appearing in Appendix B. In all conditions, participants were exposed to actual printer outputs for two Hewlett-Packard (HP) printer options. We designed the output for Option 2 to be visibly and objectively better than that of Option 1, a difference confirmed by pretests. In the first condition (with no brand names), the two options were labeled HP Option 1 and HP Option 2. In the second condition (with ABs), the same two options were labeled HP 530 (Option 1) and HP 210 (Option 2). The HP 210 provided better output than the HP 530. We labeled the lower-quality option with an AB that had a higher numeric portion to determine whether such branding would lead to preference for the option, even when it was objectively inferior. In a third condition (exposure to competitor branding), participants were told that they would be shown various printer options from different printer manufacturers (Dell, Epson, and HP) and then would be asked to choose between two randomly selected printer options. Participants first considered the printer outputs from Dell and Epson, labeled with AB. The Dell and Epson brand names were aligned such that higher-level ABs corresponded with better print outputs (see Appendix B). Then, respondents chose between two (supposedly) randomly determined printer options (same as in the second condition, HP 530 and HP 210). This third condition was exploratory and designed to check whether being exposed to aligned-ascending ABs before choice would cue participants to follow "the higher, the better" logic even more closely when they had to choose, though the lower-level HP brand was associated with better output.

Results

We ran a logistic regression with brand name (no brands, ABs, exposure to competitor branding) as the independent variable and choice (Option 1 = 1; Option 2 = 0) as the dependent variable. The model was significant ($\chi^2(2) = 14.7$, $p < .001$). Option 1, the lower-quality printer, was preferred more in the AB condition than in the no brand condition ($M_{Alpha} = 53\%$ versus $M_{NoBrand} = 23\%$; $\chi^2 = 5.1$, $p < .03$). Exposure to competitors' aligned-increasing ABs before choice significantly increased preference for the worse printer, Option 1 ($M_{Alpha+Exp} = 78\%$), compared with in the no brand condition ($\chi^2 = 14.7$, $p < .001$) and the AB condition ($\chi^2 = 2.7$, $p < .1$).

Discussion

Study 3 again showed that consumers tended to follow "the higher, the better" heuristic with respect to ABs. This tendency occurred even though consumption outcomes were readily observable and reversed from the alphanumeric alignment and the experiment was incentive compatible. That is, respondents were aware that they might receive the printer they chose. These results demonstrate that consumers' use of this heuristic to respond to ABs results in objectively suboptimal choices even when consumption outcomes (here, printer output quality) are readily observable and preferences matter to the consumer.

We also took the opportunity to examine whether competitors' branding affects consumer choice among focal alphanumeric brands. Exposure to the use of aligned-ascending ABs by competitors increased choices of the option with the higher brand name, even though it was the lesser option in terms of quality. Therefore, the use of ABs in a category can increase their effectiveness in that category. Unfortunately, this finding points to the potential for consumer confusion and marketer manipulation. We return to this potentially rich finding in our discussion, though pursuing it further is beyond the scope of this article.

Overall, Studies 1, 2, and 3 demonstrated that aligned-ascending ABs influence consumer decisions. As important as this finding is, these studies leave several open issues. First, we focused on choice outcomes and ignored choice

processes; therefore, we have not yet examined the underlying mechanisms for choices. Second, we did not investigate whether consumers' individual characteristics, such as their need for cognition, affected how they used AB information. Third, all attribute values were available for the choice options, so we were unable to observe how ABs would affect choices if some attribute information were missing. Fourth, we only examined products whose attributes were familiar to participants, and we only delved deeply into aligned ABs, without examining other types of products. To respond to these issues, we conducted Study 4, in which we employed verbal protocols to investigate the choice process, measured need for cognition to investigate effects of individual differences on choice and the choice process, and manipulated the availability of information and taxonomic product categories.

STUDY 4: THE ROLES OF NEED FOR COGNITION, PRODUCT/BRAND TYPE, AND AVAILABILITY OF ATTRIBUTE INFORMATION

One hundred ninety-eight students, participating for course credit, were exposed to two purchase scenarios in which they chose one option from a binary choice set. Half the participants saw two products with aligned ABs; the other half saw two products with unaligned ABs. In addition, for half the participants, the scenarios provided complete information, whereas for the other half, the scenarios were missing information. Finally, the ABs in each choice set were ordered high and then low or low and then high. Thus, we used a between-subjects 2 (attribute information: complete versus missing) × 2 (brand name order: low–high versus high–low) × 2 (AB alignability: aligned [copiers, air purifiers] versus nonaligned [holograms, jeans]) design.

Through pretests, we identified four different products that fit our taxonomy in Table 1. As in Study 1, copiers were labeled with aligned-ascending ABs, following "the higher, the better" logic. As in Study 2, air purifiers were labeled with aligned-descending ABs, following "the lower, the better" logic. For the nonaligned category, we identified holograms as a new product with three-dimensional visual-communication capabilities and unknown attributes (e.g., transmittance rate). Participants had no idea whether higher/lower attribute values or brand levels were better for holograms, so the AB labels were nonaligned and nonmonotonic. Jeans provided a nontechnical product, labeled with nonaligned monotonic ABs, such that consumers' preferences would not necessarily match the trends followed by the attribute values or the numbers in brands. The choice sets appear in Appendix C.

Participants were asked to write down all their thoughts as they made their decisions so we could examine the underlying decision processes. In the complete information condition, all product attributes were available, and participants simply chose between the two options labeled with ABs in high–low or low–high order. In the missing information condition, participants chose from the same choice sets, but each product option was deliberately missing an attribute to increase the uncertainty of the choice.

Measures

The dependent variable was the choice of Option 1 versus Option 2, with options labeled as high–low and low–high ABs. Participants completed the 18-item need-for-cognition scale (Cacciopo and Petty 1982), which we used as an individual difference variable. Finally, because our focus was on the choice process, respondents listed all their thoughts during the decision. The order of the brand-related thoughts was important for understanding the differences in the decision processes of HNCs and LNCs, and therefore, we asked participants to list their thoughts in the order they came into their minds. We coded these thoughts into two categories: brand heuristics (e.g., "CR-P30 is higher than CR-P20, so it must be better") or brand–attribute relationships (e.g., "I think CR-P30 can print 30 pages"). These codes enabled us to compare whether participants used "the higher, the better" heuristics based on ABs or tried to relate the ABs to specific product attributes, especially in the missing information conditions.

Results

Choice. Participants' need-for-cognition levels were median split (median = 3.2) to allow for an easy comparison of choices made by HNCs versus LNCs. We conducted separate logistic regression analyses for each product. The dependent variable was choice (Option 1 = 1; Option 2 = 0), and the independent variables were brand name order (high–low versus low–high), availability of attribute information (missing versus complete), and need for cognition (HNC versus LNC). The results appear in Table 3.

For copiers, the overall model was significant ($\chi^2(7) = 16.4$, $p = .02$). The only significant effect was a main effect of brand name order (b = 1.8, Wald $\chi^2 = 11.1$, $p < .01$). In support of H_1, participants followed the aligned-ascending ABs ("the higher, the better" logic) and chose higher-level brands regardless of attribute availability or their need for cognition.

For air purifiers, the ABs were aligned-descending ("the lower, the better"). As in Study 2, the overall model was not significant ($\chi^2(7) = 10.9$, $p > .1$), but there was a significant interaction of need for cognition and availability of attributes (b = 2.5, Wald $\chi^2 = 7.5$, $p < .01$). In the complete information condition, neither need for cognition nor brand names had significant effects on choices. However, with missing information, HNCs (versus LNCs) were more likely to follow the aligned-descending ABs and choose the lower-level brands (b = 3.1, Wald $\chi^2 = 5.5$, $p < .05$). Consistent with H_3, HNCs were more likely to infer missing values on the basis of ABs.

For holograms, the ABs were nonaligned and nonmonotonic; the attributes were totally unknown to participants. The overall model was significant ($\chi^2(7) = 34.1$, $p < .001$), with a significant main effect of brand name order, such that higher-level brands were preferred more (b = 2.3, Wald $\chi^2 = 20$, $p < .001$), and a significant interaction of attribute information and need for cognition (b = 2.1, Wald $\chi^2 = 4.2$, $p < .05$). Contrast analyses did not yield a significant effect of attribute availability on LNCs' preferences for higher-level ABs (b = .2, Wald $\chi^2 = .05$, $p > .1$) but did for HNCs, such that HNCs were more likely to choose higher-level ABs in missing (versus complete) attribute information conditions (b = 2.0, Wald $\chi^2 = 6.5$, $p < .02$). In support of H_5, even when consumers had no prior knowledge of the product type, attributes, or branding, they tended to use ABs and "the higher, the better" logic, but HNCs were more likely to

Table 3
STUDY 4: CHOICE DISTRIBUTION OF OPTION 1

Attribute Information	*Need for Cognition*	*Option 1 Branding*	*Aligned-Ascending ("The Higher, the Better"): Copiers*	*Aligned-Descending ("The Lower, the Better"): Air Purifiers*	*Nonaligned, Nonmonotonic Unknown Product: Holograms*	*Nonaligned, Monotonic, Nontechnical Product: Jeans*
Complete information	High	High	33%	40%	88%^{a**}	41%
		Low	24%	47%	54%^{b**}	38%
	Low	High	67%^{a***}	66%^{a*}	78%^{a**}	56%
		Low	10%^{b***}	30%^{b*}	33%^{b**}	58%
Missing information	High	High	50%^{a*}	30%	60%^{a**}	20%
		Low	14%^{b*}	57%	10%^{b**}	40%
	Low	High	62%^{a**}	77%^{a**}	87%^{a***}	53%
		Low	19%^{b**}	31%^{b**}	27%^{b***}	33%

*$p < .1$.
**$p < .05$.
***$p < .01$.
Notes: Different superscript letters indicate significant differences in choices of Option 1 labeled with a high- versus low-level AB.

do so with missing attribute information than LNCs, which also provides partial support for H_3.

For jeans, neither the model ($\chi^2(7) = 5.5$, $p > .6$) nor any other effects were significant. In support of H_5, nonaligned ABs did not affect choices among nontechnical products. Our choice to dichotomize the need-for-cognition variable enabled us to show the differences in the choices of HNCs versus LNCs; however, we lost some information about the variable. To remedy this, we replicated the analysis using need for cognition as a continuous variable (for the results, see Web Appendix B at http://www.marketingpower.com/jmrdec10).

Thought protocols. We collected thought protocols to identify participants' cognitive processes. First, we examined the primacy of brand-related thoughts. We formed a reversed measure for the primacy of thoughts using a six-point scale, where higher numbers indicated the recency of the thoughts (5 = "the first thought was about brand names," 4 = "brand-related thoughts came toward the beginning," 3 = "brand-related thoughts came right in the middle," 2 = "brand-related thoughts came toward the end," 1 = "the last thought was about brand names," and 0 = "no brand name–related thoughts"). An independent coder and one of the authors agreed 94% of the time and resolved discrepancies with discussion. This was a more feasible measure than ranking, which could not accommodate situations in which respondents did not list any brand-related thoughts or listed too many or too few, which thus would distort the level of thought primacy.

A significant, negative correlation between the thought primacy measure and need-for-cognition level (r = –.25, n = 101, $p < .01$) suggested that regardless of product category, LNCs generated brand-related thoughts earlier in the decision process than HNCs. To test this finding further, we conducted a set of ordinal regression analyses for each product, with brand name order, attribute information, and need for cognition as the independent variables and the thought primacy index as the dependent variable. With the exception of jeans, there were significant main effects of need for cognition on the primacy of thoughts for all product types, as we detail in Web Appendix C (http://www.marketingpower.com/jmrdec10). The findings provide more direct support for H_4 and suggest that LNCs (versus HNCs) are more likely to engage in brand-related thoughts at earlier stages of their decision process when choosing among ABs.

The brand-related thoughts were also coded as either brand heuristics or brand–attribute relationships. A set of mixed analyses of covariance were conducted for each product, with 2 (attribute information) × 2 (brand name order) between-subject factors, need for cognition as a covariate, and a two-level (brand processing: brand heuristics versus brand–attribute relationships) repeated measures factor. Using brand processing as a two-level dependent variable enabled us to compare the two methods for processing ABs across consumers with different need-for-cognition levels and with various types of attribute information across product categories. In support of H_2 and H_3, there were significant interactions of need for cognition with brand processing for all products except jeans, suggesting that LNCs are more likely to use a brand heuristic than brand–attribute relationships. (We provide the analysis of variance tables in Web Appendix D at http://www.marketingpower.com/jmrdec10.)

Discussion

This study's findings were important for several reasons. First, because we tested all four categories of our taxonomy, our results reveal that ABs affect consumer choice for a wide range of products, including when consumers have no information about the product category or meanings of the attributes. Second, alphanumeric branding affects consumer preferences when there is missing attribute information. Third, our investigation of the role of need for cognition on the effects of ABs enabled us to better interpret previous findings. Especially with missing information, LNCs were more likely simply to choose options with higher-level ABs, even when better products were labeled with lower-level ABs (i.e., aligned-descending brands of air purifiers, as in Study 2) or when attributes and products were totally unknown (i.e., holograms). In contrast, HNCs were more likely to scrutinize brand–attribute relationships and make inferences about the attributes on the basis of the ABs. Fourth, verbal protocols revealed that LNCs used "the higher, the better" brand name heuristic and used it earlier. Regardless of attribute values, they were more likely to

assume that higher-level ABs corresponded to better products. In contrast, HNCs processed ABs more deeply instead of immediately basing their decisions on the ABs.

Overall, this study provides important insights about the decision processes of HNCs and LNCs. Nevertheless, the findings are based on a relatively obtrusive examination of respondents' decision process that might interfere with that decision process. Although verbal protocols indicated that some participants made inferences about missing attributes, we did not fully capture the inferred values and their relationship to the ABs. In addition, we did not examine how inference making might affect participants' choices. Finally, each participant responded to only two of our four taxonomic categories. This design prevented us from observing differences in individual decision processes when the products were labeled differently. To resolve these issues, we conducted Study 5 with a mixed design and a manipulation of inference making.

STUDY 5: INFERENCE MAKING AND ABs

Two hundred twenty-six undergraduate students participated for extra course credit. We used a 3 (attribute information: complete, missing, inference) × 2 (branding: low–high, high–low) between-subjects × 4 (product: cameras, laser printers, warmerjacks, suit coats) within-subject design. The procedure was similar to that of Study 4 with a few differences. First, all participants made choices among options for all four categories (i.e., technical, nontechnical, and really new products labeled with aligned and nonaligned brands), presented in random order. This allowed for a within-subject comparison of participants' individual choices. Second, to avoid confounding or carryover effects, we did not ask respondents to report their thoughts during the choice process. Third, to increase the generalizability of our findings and replicate our results, we used four different products (see Appendix D). Fourth, the procedure in the complete and missing information conditions was similar to that in Study 4, except that we added a third, inference condition, in which respondents were exposed to the incomplete options and instructed to make explicit inferences about the missing attributes before they chose. This enabled us to observe the inferred values, their fit with brand names, and their effects on choice.

Because cameras had been used in Study 1, we chose them as the aligned-ascending category for which the assigned ABs followed "the higher, the better" logic. Because printers had been used in Study 2, we chose them for the aligned-descending category, and the ABs were assigned accordingly. Warmerjack was a new, nonexistent product (i.e., a lightweight, thin jacket that provides adjustable heating for the body) that was unknown to the participants. It was labeled with nonaligned and nonmonotonic ABs, such that respondents had no idea whether higher or lower values of the fictional attributes (e.g., emulsion rate) or higher- or lower-level brands were better. Finally, suit coats were identified as a nontechnical category and labeled with nonaligned monotonic ABs, because preferences would not follow the numeric trends of the ABs.

Similar to our previous studies, the primary dependent variable was the choice share between the two options. Participants completed the 18-item need-for-cognition scale. As an additional measure, in the inference condition, participants made explicit inferences about the absent attributes. We analyzed these inferred values as well.

Results

Participants' need-for-cognition levels were median split (median = 3.15). This enabled us to compare the differences between choices and inferences of HNC versus LNC decision makers.

Choice. We conducted a logistic regression analysis for each product in which the independent variables were the brand name order of the two options (high–low versus low–high), attribute information (complete, missing, inference), and need for cognition (HNC versus LNC). The dependent variable was the binary choice (Option 1 = 1; Option 2 = 0) of each product, as in Table 4.

For cameras, the overall model was significant ($\chi^2(11) = 23.7$, $p = .014$). The significant main effect of brand name

Table 4
STUDY 5: CHOICE DISTRIBUTION OF OPTION 1

Attribute Information	*Need for Cognition*	*Option 1 Branding*	*Aligned-Ascending ("The Higher, the Better"): Cameras*	*Aligned-Descending ("The Lower, the Better"): Laser Printers*	*Nonaligned, Nonmonotonic Unknown Product: Warmerjacks*	*Nonaligned, Monotonic, Nontechnical Product: Suit Coat*
Complete information	High	High	45%	15%	55%	45%
		Low	38%	29%	43%	57%
	Low	High	72%^{a*}	56%	78%^{a**}	50%
		Low	37%^{b*}	32%	16%^{b**}	42%
Missing information with inference	High	High	63%^{a**}	26%^{a*}	84%^{a**}	68%
		Low	21%^{b**}	58%^{b*}	37%^{b**}	63%
	Low	High	59%	41%	88%^{a**}	29%
		Low	40%	50%	10%^{b**}	40%
Missing information	High	High	50%	28%	72%	61%
		Low	37%	37%	47%	47%
	Low	High	74%^{a**}	68%^{a*}	74%^{a**}	63%
		Low	29%^{b**}	35%^{b*}	29%^{b**}	41%

$^{*}p < .05$.
$^{**}p < .01$.
Notes: Different superscript letters indicate significant differences in choices of Option 1 labeled with a low- versus high-level AB.

order (b = 1.14, Wald χ^2 = 16.14, $p < .001$) suggested that, in general, participants followed the aligned-ascending ABs and chose higher-level brands, in support of H_1. There was also a marginally significant three-way interaction of brand name order, need for cognition, and attribute information (b = 2.3, Wald χ^2 = 2.8, $p < .1$). Although HNCs did not exhibit a strong preference for higher-level brands in the complete or missing information conditions (both b < 1, Wald $\chi^2 < 1$), in the inference condition, they chose ABs with higher numbers (b = 1.86, Wald χ^2 = 6.4, $p = .012$), in support of H_3. In support of H_2, LNCs also followed "the higher, the better" logic, regardless of attribute information or inference making, and there was no interaction of brand name order with attribute information (b < 1, Wald $\chi^2 < 1$).

For laser printers, the ABs were aligned-descending. The overall model was significant ($\chi^2(11) = 22.0$, $p = .024$), but the main effect of brand name order was not (b < 1, Wald $\chi^2 < 1$). There was a significant main effect of need for cognition (b = .69, Wald χ^2 = 5.6, $p = .018$), qualified by a significant interaction of brand name order and need for cognition (b = 1.53, Wald χ^2 = 7.0, $p < .01$). Further analysis showed that HNCs followed the brand names and preferred lower-level ABs (b = .86, Wald χ^2 = 4.1, $p < .05$). In support of H_3, these preferences were driven by inference making in the inference condition (b = 1.35, Wald χ^2 = 3.7, $p < .05$). In contrast, LNCs still somewhat preferred higher-level ABs (b = .7, Wald χ^2 = 2.9, $p < .1$) even though they were aligned-descending. This was driven by the choices in the missing information condition (b = 1.4, Wald χ^2 = 3.8, $p < .05$) and is consistent with H_2.

Warmerjacks were labeled with nonaligned and nonmonotonic ABs, and participants had no idea whether higher or lower attributes or brand levels were better. Yet the overall model for wamerjacks was significant ($\chi^2(11) = 64.1$, $p < .001$). In support of H_5, the significant main effect of brand name order (b = 2.13, Wald χ^2 = 42.0, $p < .01$) indicates that when consumers have no prior knowledge of the product type or the meanings of attributes, they tend to choose higher-level ABs. There was also a significant interaction of brand name order and need for cognition (b = 1.76, Wald χ^2 = 7.15, $p < .01$) because, in support of H_2, LNCs were more likely to follow "the higher, the better" logic (b = 3.0, Wald χ^2 = 34.2, $p < .001$) than HNCs (b = 1.25, Wald χ^2 = 9.4, $p < .01$). In addition, there was a marginally significant interaction of brand name order and attribute information (b = 1.5, Wald χ^2 = 3.2, $p < .08$). Compared with the complete information condition, the effect of brand name order was stronger in the missing information condition (b = 1.5, Wald χ^2 = 17.8, $p < .001$), and it became even stronger in the inference condition (b = 2.2, Wald χ^2 = 32.1, $p < .001$).

For suit coats, the model was not significant ($\chi^2(11) = 11.6$, $p > .3$). A marginally significant effect of need for cognition (b = .53, Wald χ^2 = 3.7, $p < .06$) indicated a slight difference in choices of HNCs and LNCs. However, in support of H_5, the lack of any other brand name–related effects indicated that nonaligned ABs did not influence choices among nontechnical products. The dichotomization of the need-for-cognition variable enabled us to show the differences in choices of HNCs versus LNCs, but it also led to some information loss. Therefore, we replicated the analysis using need for cognition as a continuous variable (see Web Appendix B at http://www.marketingpower.com/jmrdec10).

Inferences. In the inference condition, participants made explicit inferences about the absent attribute values before they chose. Comparison of these inferences with ABs was somewhat complicated. It was not possible to correlate ABs with the inferred values for the missing attributes, because the numeric portions of ABs were constant. Similarly, comparison of ABs with inferences was not feasible, because a Canon DC-700MX used 700 as the numeric portion, which would differ from the inferences made for a missing megapixels attribute (which only ranged from 2 to 10). Therefore, we identified the most logical values consumers would assume for the missing attributes if they were to use the ABs to make their inferences (e.g., 7 megapixels for a DC-700MX) and used pairwise comparisons of these values with the inferred attribute values for the two need-for-cognition categories.

Another factor we examined was whether the ABs were directly linked to the specific attributes being inferred. For example, in the low–high brand condition, the megapixels for DC-700MX were unknown (see Appendix D). Because DC-800MX has 8.1 megapixels, the megapixels might be related to the ABs, and if so, consumers might infer that the DC-700MX will have about 7 megapixels. The zoom information was not available for DC-800MX. Because the zoom capacity for the DC-700MX was 8×, zoom did not seem to be clearly linked to the ABs. In the high–low brand condition, when the brand labels were reversed, DC-800MX had 8× zoom and seemed to be linked to the AB, whereas DC-700MX had 8.2 megapixels and did not seem to be linked to the AB. Therefore, we separately analyzed the inferences made when the missing attribute was clearly linked versus unlinked to the AB.

Table 5 shows the averages of 16 values inferred by HNCs and LNCs, half of which occurred when ABs were clearly linked to the attributes (in bold). When the brands were linked to the attributes, only 2 of 8 inferences by HNCs were significantly different from the attribute values cued by ABs; 7 of 8 inferences by LNCs were significantly different. When the ABs were not linked to the missing attributes, 3 of 8 inferences made by HNCs were significantly different, compared with 6 of 8 inferences by LNCs. Comparisons of the inferred values with the attribute values cued by the ABs in Table 5 suggest that HNCs were more likely to follow the alignment of ABs and pay attention to the brand–attribute relationship to make their inferences. In the inference condition, all participants were forced to make inferences about missing attributes. Because LNCs may not have made any inferences in their regular decision process (according to the results of Study 4), this comparison was a rather conservative test.

We also ran a multivariate analysis of variance, in which the inferred values served as the dependent variables, and 2 (brand name order) × 2 (need for cognition) variables were the between-subjects factors. A significant main effect of need for cognition suggested that inferences made by HNCs and LNCs differed significantly ($F(8, 64) = 4.7$, $p < .01$, Pillai's trace = .37). There was also a main effect of brand name order, indicating that inferences were significantly affected by the AB labels, such that the inferred values were larger when the AB corresponding to the missing attribute

Table 5
STUDY 5: AVERAGE ATTRIBUTE VALUES INFERRED BY HIGH- VERSUS LOW-NEED-FOR-COGNITION DECISION MAKERS

	Branding			
	Low–High		*High–Low*	
Aligned-Ascending Canon Camera	DC-700MX	DC-800MX	DC-800MX	DC-700MX
Megapixels (Range: 2–10)	**HNC: 7.3** **LNC: 7.6**	8.1	HNC: 8.2 LNC: 8.7**	8.1
Optical zoom (Range: 2×–12×)	8×	HNC: 8.7 LNC: 9.2**	8×	**HNC: 7.5** **LNC: 6.8***
Aligned-Descending HP Printer	DJ-80	DJ-100	DJ-100	DJ-80
Page print speed (Range: 2 seconds–15 seconds)	**HNC: 8.4** **LNC: 9.8***	11.2	HNC: 9.5 LNC: 10.8	11.2
Cost of a page (Range: 5 cents–15 cents)	10.7	HNC: 9.6 LNC: 11.5*	10.7	**HNC: 8.7*** **LNC: 10.3***
Nonaligned, Nonmonotonic Nike Warmerjack	NW-200	NW-400	NW-400	NW-200
Diffusion rate (Range: 100d–500d)	**HNC: 216** **LNC: 257***	395d	HNC: 377 LNC: 388	395d
Emulsion degree (Range: 1%–90%)	40%	HNC: 59%* LNC: 67%*	40%	**HNC: 26%** **LNC: 34%**
Nonaligned, Monotonic Perry Ellis Suit Coat	P2	P8	P8	P2
Fabric blend (Range: percentage cotton)	HNC: 24% LNC: 35%*	80%	HNC: 45%* LNC: 50%*	80%
Total buttons (Range: 1–8)	2	HNC: 4.6* LNC: 4.1*	2	HNC: 3.1* LNC: 3.2*

*Inferred attribute value is significantly different from the value cued by the alphanumeric brand at $p < .05$.
**Inferred attribute value is significantly different from the value cued by the alphanumeric brand at $p < .1$.
Notes: Bold cells show the average of inferred values for the missing attributes by decision makers with high and low need for cognition (HNCs and LNCs) when brand names are linked to the attributes (e.g., in the low–high branding condition, megapixels are linked to the brands, because DC-800MX has 8 megapixels). Cells with regular font indicate inferences made when brand names are not directly linked to the attribute values (e.g., in the high–low brand condition, megapixels are not linked to the brands because DC-700MX has 8 megapixels).

was higher ($F(8, 64) = 22.7$, $p < .01$, Pillai's trace = .74). The interaction effect was not significant ($F(8, 64) < 1$).

Discussion

Study 5 replicated the findings of Study 4 using different product categories without obtrusive verbal protocols. Furthermore, it showed that the between-subjects differences observed in our previous studies matched the within-subject differences in individual respondents' choices among various types of ABs. We also examined the role of inference making. Our investigation showed that HNCs were more likely to base their inferences on perceived correlations of ABs and product attributes, suggesting systematic, analytic processing of ABs. In contrast, LNCs' inferences were based predominantly on the overall magnitude of the numeric portions included in the AB, suggesting more heuristic processing.

GENERAL DISCUSSION

A brand name is crucial for conveying a positive image of the firm, signaling specific attributes or overall product quality to consumers, and influencing purchases (Kohli and LaBahn 1997). Although ABs constitute a significant portion of the brand names in the marketplace, their potential effects on purchase decisions have not been examined. This article attempts to understand how ABs affect consumer choice. To the best of our knowledge, this research is the first to demonstrate empirically that ABs can shift consumers' preferences. Starting with a comprehensive taxonomy of ABs, we show that the effects of these brand names on choices were based on either their perceived relationship to product attributes or the automatic belief that higher numeric portions of brand names indicated the recency and/or superiority of products. We found that LNCs are especially likely to follow "the higher, the better" heuristic when choosing among ABs for a wide range of products, regardless of attribute information availability.

When the product options were missing important attributes, and even when the meanings of attributes were unknown, ABs still significantly influenced choices. Thus, our findings support the argument that choices depend heavily on the decision context. Brand names play an important role on preference formation. The results also imply that consumer choice can be manipulated fairly easily by marketers in real-life purchases. As Kivetz and Simonson (2000) assert, it is difficult for consumers to find specific product information hidden in user manuals or other documents presented by the manufacturer, and consumers rarely read them after purchases. Internet and catalog channels provide marketers with a higher level of control over the choice context, which has led to an opportunity for marketers to design their catalogs and Web pages strategically to maximize the salience of favorable information on the items they want to promote and minimize or conceal weaker features. Manipulation of the order of ABs is another example of the same phenomenon. It may be good for marketers, but it has troubling implications for consumers and public policy makers. Our research shows that LNCs especially tend to rely on the brand name earlier in their decision process, with little or no regard for the attributes or their availability. Even HNCs follow the AB alignment, albeit much more systematically, for

both familiar and really new products, which provides a strong indication of the importance of ABs.

It is well established that consumers overrate the connection between price and quality (see Cronley et al. 2005). Price is a salient cue and an extrinsic attribute strongly associated with quality; to avoid its confounding effects with brand name, we controlled for it in our studies. Prior research (e.g., Huber and McCann 1982) has documented the effects of price on quality judgments in a missing information domain. Additional research should address the possibly competing effects of price versus alphanumeric brands on product choices.

Our research focused on ABs marketed under a real parent brand, such as Sony C7X versus C8X (as opposed to Sony C7X versus Canon C8M) to avoid the confounding effects of existing attitudes toward competing brands. However, in Study 3, we examined how the ABs of competing firms may affect each other. The increase in preference for the ABs with higher numeric portions after exposure to competitors' aligned-ascending ABs, despite the product's inferiority, has significant marketing and public policy implications. Although this issue is by no means the predominant focus of our article, it suggests an opportunity for further research.

In conclusion, this work reopens an important avenue for further research; ABs are used regularly as brand names in many product categories, and we examine several factors that influence their effects on consumer choice. However, there are many opportunities for additional research in this domain, including marketer-controlled factors such as the effects of parent brands and option variety; consumer-related factors such as category knowledge, cognitive load, technology familiarity, and age and education; and various situational variables such as category presentations that can be manipulated by retailers.

Appendix A

STIMULI FOR STUDY 1 AND STUDY 2: LOW-HIGH BRANDING CONDITIONS

A: Study 1: Aligned-Ascending Brands ("The Higher, the Better")		
Canon Digital Cameras	DC-700MX	DC-800MX
Megapixels (Range: 2–10)	7.2 megapixels	8.1 megapixels
Optical zoom (Range: 2×–12×)	8×	7×
LCD screen (Range: 1.8 inches–3.3 inches)	2.6 inches	2.2 inches
Xerox Copy Machines	CR-P20	CR-P30
Maximum copying speed (Range: 15 pages per minute –50 pages per minute)	22	31
Maximum feeding capacity (Range: 1500 sheets–4500 sheets)	2995	1995
B: Study 2: Aligned-Descending Brands ("The Lower, the Better")		
HP Laser Printers	DJ-80	DJ-100
Speed of printing a page (Range: 2 seconds–15 seconds)	7.9 seconds	11.2 seconds
Cost of a page (Range: 5 cents–15 cents)	10.7 cents	8.3 cents
Honeywell Air Purifiers	KP-300	KP-700
Minimum particle size that can be filtered (Range: .2 microns–1 microns)	.3 microns	.7 microns
Energy consumption (Range: 20 kilowatts–100 kilowatts)	71 kilowatts	33 kilowatts
Nokia Cell Phones	N-2391	N-3571
Length of battery charging time (Range: 1 hour–5 hours)	2.4 hours	3.5 hours
Size of the cell phone (Range: 2.0 ounces–5.0 ounces)	3.57 ounces	2.38 ounces

Notes: In the high–low branding conditions, the AB labels for Options 1 and 2 were reversed for each product.

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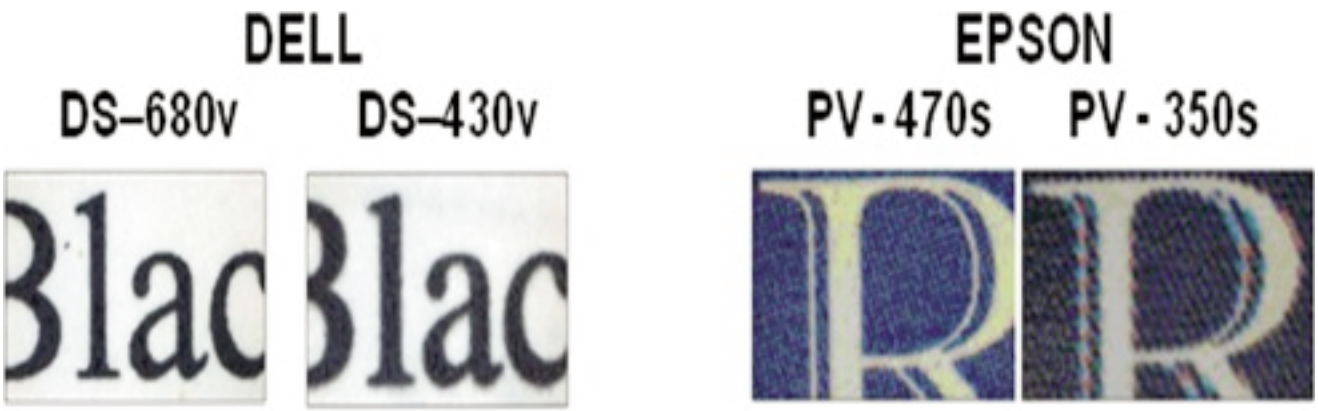
Appendix B

STUDY 3 STIMULUS: ZOOMED PRINTER OUTPUTS

	Printer Option 1	*Printer Option 2*
Original Output		
Zoomed Output		
No-brand-names condition	HP Option 1	HP Option 2
Alphanumeric brand condition	HP 530	HP 210
Alphanumeric brand + exposure	HP 530	HP 210

In the alphanumeric brand + exposure condition, before choosing between the two HP printers, participants saw supposedly zoomed outputs of the fictional Dell and Epson printer brands:



These outputs are not associated with real printer brands. Some were retrieved from the HP Web site and distorted to serve the purpose of the experiment. Because the actual outputs were in color, it may be difficult to observe the differences (see also Web Appendix E at http://www.marketingpower.com/jmrdec10).

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Appendix C

STUDY 4 STIMULUS: LOW–HIGH BRANDING CONDITIONS

A: Aligned-Ascending Brands ("The Higher, the Better")		
Xerox Copy Machines	CR-P20	CR-P30
Maximum copying speed (Range: 15 pages per minute –50 pages per minute)	*22*	31
Maximum feeding capacity (Range: 1500 sheets –4500 sheets)	2995	*1995*
B: Aligned-Descending Brands ("The Lower, the Better")		
Honeywell Air Purifiers	KP-300	KP-700
Minimum particle size that can be filtered (Range: .2 microns–1 microns)	*.3 microns*	.7 microns
Energy consumption (Range: 20 kilowatts–100 kilowatts)	71 kilowatts	*33 kilowatts*
C: Nonaligned, Nonmonotonic Brands (Really New Product with Unknown Attributes)		
Sony Holograms	HOLX-1000	HOLX-3000
Compulsion rate (Range: 1000–5000)	*1005*	3030
Transmittance degree (Range: 100–500)	307	*102*
Reflectance volume (Range: 0–3)	1	1
D: Nonaligned, Monotonic Brands (Nontechnical Product)		
Levi's Jeans	Levi's 305	Levi's 503
		
Fabric density (Range: 12–16 oz.)	*13.0 oz*	15.0 oz
Pockets (Range: 3–5)	5	*3*
Zipper/buttons	zipper	zipper

Notes: In the missing-information condition, the italicized attribute values were replaced with "—," and participants made their choices in the absence of those attribute values. In the high–low branding condition, the brand names were reversed. Participants saw only two product choice sets, the first two or the last two, in random order.

Appendix D

STUDY 5 STIMULUS: LOW–HIGH BRANDING CONDITIONS

A: Aligned-Ascending Brands ("The Higher, the Better")		
Canon Digital Cameras	DC-700MX	DC-800MX
Megapixels (Range: 2–10)	*7.2 MP*	8.1 MP
Optical zoom (Range: 2×–12×)	8×	*7×*
LCD screen (Range: 1.8–3.3 inches)	2.6"	2.2"
B: Aligned-Descending Brands ("The Lower, the Better")		
HP Laser Printers	DJ-80	DJ-100
Speed of printing a page (Range: 2 seconds–15 seconds)	*7.9 sec*	11.2 sec
Cost of a page (Range: 5 cents–15 cents)	10.7 cents	*8.3 cents*
C: Nonaligned, Nonmonotonic Brands (Really New Product with Unknown Attributes)		
Nike Warmerjack	NW-200	NW-400
Diffusion rate (Range: 100–500)	*210**	395
Emulsion degree (Range: 1%–90%)	40%	*22%**
D: Nonaligned, Monotonic Brands (Nontechnical Product)		
Perry Ellis Suit Coat	P2	P8
		
Fabric blend (Range: 0%–100% wool + 0%–100% cotton)	*80% wool +20% cotton*	80% cotton +20% wool
Total number of buttons (1–8)	2	*4*

Notes: In the missing-information condition, the italicized attribute values were replaced with "—," and participants made their choices in the absence of those attributes. In the missing-information-with-inference condition, the attribute values were replaced with "___?" and participants were asked to make inferences about the missing attribute values by filling in the blanks. In the high–low branding condition, the brand names were reversed (e.g., P8 versus P2 instead of P2 versus P8). Participants were exposed to all four product choice sets in random order.

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