DEBORAH ROEDDER JOHN and RAMNATH LAKSHMI-RATAN

The authors examine how children of different ages respond to the addition of new alternatives into an existing choice set. Children 4 to 12 years of age made choices from an initial and an expanded set of products using a modified constant sum allocation procedure. The findings indicate that younger children respond differently than older children to the expansion of choice sets and that this pattern is related, in part, to age differences in children’s ability to incorporate similarity judgments into the choice process.

Age Differences in Children’s Choice Behavior: The Impact of Available Alternatives

Competition in the children’s market has resulted in an unprecedented wave of new product introductions. The surge of new products has been fueled not only by the introduction of new products and extensions of existing products in long-established categories such as cereals and toys, but also by the introduction of new products in relatively new categories such as electronic equipment and personal care products for young children. Representing a market with $6.2 billion in direct purchasing power, as well as an estimated $128 billion in indirect purchase influence, children now have a greater breadth and depth of products to choose from than ever before (see McNeal 1987).

Despite this level of activity, virtually no attention has been directed toward understanding how the introduction of new products alters children’s choice behavior. A critical issue in this regard is the extent to which new products will be chosen over existing ones in the marketplace. Inquiry along these lines is essential if one is to predict how the introduction of new products will affect the market position of existing product offerings and to understand the factors likely to influence the continued success of established products or classes of products in the face of new product entrants.

To date, the only available evidence on either of these two issues is from a single study, reported by Roedder, Sternthal, and Calder (1983), addressing children’s responses to advertising for a new product. Though the focus of the study was advertising rather than new product introductions, the authors found, as part of their investigation, that age was a determining factor in children’s selection of new products. After viewing an advertisement that elicited a positive predisposition toward a new product, younger children chose the new product more frequently than did older children, even though both age groups had similar affective reactions to the new item. This finding suggests that younger children may be more likely to try new products, leading perhaps to an enhanced market position for new products among this age segment. Still at issue, however, is how children’s receptivity to new products ultimately affects choices of existing products or classes of products. Evidence about how established products may fare once new products have been introduced into the marketplace has yet to emerge.

Accordingly, the purpose of our article is to examine how children of different ages alter choices of existing items in a choice set once new alternatives are made available. In particular, we investigate whether age differences are present in the way children make choices when faced with an expanded set of products and, if so,
what age-related factors might account for these differences. In examining children's choice behavior, we are interested in how the addition of new alternatives to a product category affects children's choices from that category in comparison with other competitive product categories. Note that the focus here is not on intracategory switching between new and existing items in the same product category, but rather on intercategory switching between new and existing items in competitive categories. Though both types of effects warrant investigation, we examine behavior at the category level to develop an experimental paradigm capable of exploring factors that might underlie age differences in choice behavior.

First, we present a conceptual framework, based on concepts from mathematical choice theory and child psychology, to describe how children of different ages might respond to the introduction of new products. On the basis of this framework, we present predictions related to age differences in children's choice behavior. We then describe the experimental method used to examine these predictions with a sample of children ranging in age from 4 to 12 years. Finally, we report and discuss the results in terms of their implications for understanding, influencing, and researching children's choice behavior in the marketplace.

CONCEPTUAL BACKGROUND

Patterns of Choice Behavior

Guidance in identifying basic patterns of choice behavior, though lacking in the area of children's consumer behavior, can be found in the literature on mathematical models of choice behavior developed for predicting adult choice behavior (for a review, see Corstjens and Gaultsch 1983). Though a variety of models have been proposed in this area, the literature suggests that at least two basic patterns of choice behavior exist, characterized by the extent to which the similarity between new and existing alternatives is incorporated into the choice process. The first pattern, referred to here as the proportionality scheme, emerges as a result of individuals failing to consider interobject similarity among new and existing items in the choice process. As a result, new alternatives take away market share from existing items in proportion to their original shares, regardless of the similarity between new and existing items. Quite a different result emerges when individuals incorporate similarity judgments into the choice process. In this pattern, referred to here as the similarity scheme, new alternatives take away market share disproportionately from those existing items most similar to them. Thus, the response to new alternatives is not context-free, but depends on what other alternatives already are available and how similar they are to new entrants.

These findings have clear implications for how children may distribute their choices among alternatives in an expanded choice set at the brand and category levels. At the brand level, share losses and gains among products will depend on whether children consider the similarity between new and old items in the category. If they incorporate similarity judgments into the choice process, consistent with the similarity scheme, choices of new alternatives will result in greater share losses for more similar brands. If children do not incorporate similarity into the choice process, in line with the proportionality scheme, choices of new alternatives will result in proportionately equal share losses for all competitive brands. For example, if a new variety of fruit juice were introduced into the market, share losses would be distributed equally across all brands of juice under the proportionality scenario, but would be greatest for similar brands of juice under the similarity scenario.

At the category level, which is the focus of our study, share losses and gains among competitive categories will depend on the extent to which children consider product class boundaries in the choice process. Product class boundaries reflect the similarity that exists among brands in the same category and the dissimilarity existing among products in different categories. If children incorporate these similarity notions into the choices they make, consistent with the similarity scenario, new alternatives added to one category will draw share disproportionately from brands within the same category, resulting in relatively small share losses for competitive categories. If they do not, consistent with the proportionality scenario, new alternatives added to one category will draw share proportionately from all brands across competitive categories, resulting in much larger share losses for competitive categories. Thus, share gains for the extended category will be greater under the proportionality scenario. For example, if a new variety of fruit juice were introduced into the market, share gains for the juice category and share losses for other beverage categories would be greater under the proportionality than under the similarity scenario.

Predicting Age Differences in Choice Behavior

Determining which of these patterns, proportionality or similarity, might best characterize children's choice behavior at different ages requires a theoretical basis for predicting when children are likely to incorporate similarity judgments into the choice process. In the case of category-level effects considered here, guidance is needed in identifying age-related cognitive abilities likely to influence whether children will recognize product-class similarity and incorporate that knowledge into the decision-making process as new alternatives are added to the set of choice alternatives.

Direction in this regard is provided by research in child psychology examining children's abilities to categorize or classify objects. The predominant finding in this literature is that there are age differences in children's abilities to categorize, with older children having more sophisticated categorization abilities than younger children. Age differences are quite evident, for example, in the
way children form categories. Older children tend to categorize on the basis of underlying features of objects, such as function or use, whereas younger children simply revert to categorizing objects on the basis of visually salient features, such as color or size (Bruner, Olver, and Greenfield 1966; Inhelder and Piaget 1964; Melkman and Deutsch 1977; Melkman, Tversky, and Baratz 1981; Saltz, Soller, and Sigel 1972; Tversky 1985). Age differences are also evident in the way children relate categories to one another. Younger children tend not to understand the hierarchical relationship between categories that are nested within each other, such as flowers versus roses, daises, and carnations. Older children, in contrast, are more facile in their reasoning about class hierarchies and class inclusion relationships (Inhelder and Piaget 1964; Markman and Callahan 1983; Whitney and Kunen 1983; Winer 1980).

These findings provide a basis for predicting the extent to which children will exhibit either similarity or proportionality effects in their choice behavior. In general, a shift from proportionality effects to similarity effects should occur as children grow older. If the ability to recognize category boundaries becomes more attuned with age, it seems quite plausible that a similar age trend should be observed in the tendency to factor product class similarity into the choice process. In the case of category effects, this would suggest that the resulting share gains for newly extended categories and share losses for competitive categories would be greatest for younger children and would dissipate as children grow older.

HYPOTHESES

Age Differences in Categorization

Two sets of hypotheses were developed to test our line of reasoning about age differences in children’s choice behavior. The first was a test of our assumption that children of different ages would differ in their ability to recognize product class boundaries for products included in a choice set. Based on the evidence reviewed previously, our expectation was that older children would be more adept at recognizing category boundaries than their younger counterparts. Hence, the following hypothesis was advanced.

H1: Older children recognize product class boundaries in a choice set better than younger children.

Age Differences in Choice Behavior

The second set of hypotheses was developed to test for the existence of age differences in children’s choice behavior. On the basis of the assumption that age differences exist in children’s abilities to recognize and incorporate product class similarity into their choices, we expected younger children to exhibit proportionality effects, with similarity effects becoming more dominant among older children. In the choice setting examined here, involving the addition of new alternatives to one of the product categories in an existing choice set, these age differences can be detected by changes in category share for the newly extended category. As children grow older, and exhibit similarity effects to a greater degree, share gains for extended categories should gradually lessen. Hence,

H2: When new alternatives are added to a product category, the resulting share gains for that category over competitive categories are greater for younger than for older children.

Age differences of this type can also be detected by the ability of different choice models to predict children’s choice behavior. Non-context-dependent models, such as the Luce (1959) choice model, relate choice probability to an intrinsic utility value for each object, which is independent of other objects considered in a choice occasion. In contrast, contextual choice models account for interobject similarity and substitutability, and can be used to test for the presence of such similarity effects in choice data. Consider, for example, the following situation. Presume that orange juice and apple juice have equal shares (50%) when considered as a pair, that orange juice and milk have equal choice shares (50%) when considered as a pair, and that apple juice and milk also have equal choice shares (50%) when considered as a pair. If one were trying to predict what the choice shares of each beverage would be if all were considered together in a three-way comparison, the Luce model would predict that all three items would receive equal shares (33 1/3%). However, a contextual choice model accounting for intracategory substitutability would predict that milk would receive a 50% share, with orange juice and apple juice splitting the remainder at 25% each.

With these basic differences in mind, age differences in choice behavior can be captured by how well these models predict children’s choices at different ages. If category share predictions based on each model are compared with actual choices, contextual choice models should provide a better fit than Luce models as children grow older and increasingly incorporate product class similarity into their choice process. Hence, the following hypothesis was advanced.

H2: As children grow older, contextual choice models predict their choice behavior better than a Luce choice model.

METHOD

Sample

Two hundred and ten children were recruited to participate in the study. Parents were offered $15 in cash or a donation in that amount to a designated community group or church as an incentive for their child’s participation. Children with diabetes and milk allergies were excluded from the study to avoid the potential impact of those conditions on product choices. Equal numbers of children were recruited in each of the four age groups, with equal numbers of boys and girls within each group. The final sample, reflecting a small number of cancel-
AGE DIFFERENCES IN CHILDREN'S CHOICE BEHAVIOR

lations, included 50 children aged 4 to 5 years, 53 children aged 6 to 7 years, 52 children aged 9 to 10 years, and 55 children aged 11 to 12 years.

Independent Variables

Two independent variables were incorporated into the experiment in a 4 (age) × 3 (choice set) mixed-factor design, with age as a between-subject factor and choice set as a within-subject factor. A further description of each variable follows.

Age. The age range from 4 to 12 years was selected for several conceptual and practical reasons. Conceptually, this range was considered adequate to capture possible age differences in choice behavior due to age differences in categorization abilities. Evidence from child psychology suggests that the most dramatic changes in categorization abilities occur between the ages of 4 and 9 (see Markman and Callahan 1983; Whitney and Kunen 1983). Hence, this age range was included in the study as well as an 11 to 12-year-old age group. This older group was included to cover the possibility that categorization schemes for products may emerge later or be utilized later than the categorization schemes for well-structured domains typically examined in developmental psychology (see John and Sujan 1990b). In practical terms, the range from 4 from 12 years of age was considered to be the broadest one possible without encountering problems with the experimental stimuli and tasks. Children 4 to 5 years of age were selected as the youngest group to avoid difficulties with much younger children in terms of understanding instructions and being familiar with the products used in the study. Children 11 to 12 years of age were selected as the oldest group to avoid problems with much older children having vastly different product preferences than younger age groups.

Choice set. Three choice sets were developed for the study. The first set, referred to as the initial set, included four beverages from two different categories—two milk beverages (whole milk and chocolate milk) and two juice beverages (grape juice and orange juice). The second and third sets expanded the number of available alternatives for the milk and juice categories. The second set, referred to as the expanded milk set, included beverages from the initial set plus two additional milk beverages (strawberry milk and vanilla milk). The third set, referred to as the expanded juice set, included beverages from the initial set plus two additional juice beverages (apple juice and cherry juice). Though just one of these expanded choice sets would have been sufficient to test the hypotheses, two sets were developed to provide an internal replication of the results across categories and choice alternatives. Thus, the impact of adding alternatives to an existing choice set could be assessed by comparing the initial set with the expanded milk set and comparing the initial set with the expanded juice set.

Several considerations guided the selection of these choice sets. First, the number of items included in the sets was minimized to decrease task demands on younger children. By overwhelming younger children, large sets may accentuate age differences in choice behavior far beyond those related to categorization abilities (see Roedder, Sternthal, and Calder 1983). For this reason, the maximum number of items in the largest choice sets, the expanded milk and expanded juice sets, was held to six items. With this constraint in mind, we designed the initial choice set with four items, two items per product category. This configuration allowed for equal numbers of items per category in the initial choice set and allowed for the addition of two new items to a category in the expanded choice sets. Adding two new alternatives rather than one was preferred to enhance the power of the set manipulation and encourage children to reconsider their choices from the initial set.

Second, the product categories and individual items composing the choice sets were selected to reduce the possibility that age differences in familiarity or preference might obscure or confound the results. In selecting product categories, we pursued basic-level categories (e.g., "milk") in light of evidence from child psychology that superordinate- (e.g., "beverages") or subordinate-level categories (e.g., "low fat milk") might pose a particularly difficult setting for young children in the study (see Horton and Markman 1980; Mervis and Cronin 1982; Rosch et al. 1976). With this in mind, we chose two product categories, milk and fruit juices, on the basis of their familiarity and frequent consumption across age groups. In selecting individual products within these categories, emphasis was placed on identifying items that would be similarly preferred across all four age groups. For this purpose, children in a pretest were given a list of 15 items and were asked to rate them in terms of liking on a 5-point happy face scale. Items included from the juice category were representative of those widely available in the marketplace (e.g., apple juice). Items tested from the milk category included the few currently available and familiar to children (milk and chocolate milk) and several potential varieties that could be considered truly new or novel (e.g., strawberry milk and peach milk). Examinations of children's ratings for these products yielded several items in the milk and juice categories that were viewed similarly by children of all ages.

From these possibilities, the final composition of the choice sets was based on several criteria. First, to ensure that the products could be easily identified and readily distinguished from one another by preschool children without reading skills, the products in each choice set were selected to be different from one another in color. Second, to ensure that the choice setting was a meaningful one, the products in each choice set were chosen to have varying degrees of preference as indicated by children's ratings. At least one product that was well liked in each category was included in the initial choice set and each of the expanded choice sets. Loading either the initial choice set or the expanded choice sets with the most favored products would have minimized the ability to detect age differences in children's responses to in-
creases in the number of available alternatives. Finally, to examine whether or not the type of alternatives added to the initial choice set would alter the results, items added to the milk category in the expanded milk set were selected to be truly new and novel (strawberry milk and vanilla milk), whereas those added to the juice category in the expanded juice set were representative of those currently available in the marketplace (apple juice and cherry juice).

The resulting choice sets were presented to children in a display of actual beverages. The products were displayed in identical clear plastic bottles, each with the product's name on a label in big letters. Real brand names, such as Minute Maid Orange Juice or Nestlé Chocolate Milk, were not used to rule out problems with preferences or familiarity for individual brands. Real product packages were not used to rule out the possibility that young children might be able to categorize the milk and juice items solely on the basis of the perceptual features of the packaging. Because younger children often categorize by using perceptual features of packaging (John and Sujan 1990a), and because these packaging features are well correlated with the underlying structure of the milk and juice categories, identical plastic containers were used to avoid problems that might be caused by using real packages.

Procedure

Each child participating in the study was brought to an interviewing room containing five experimental stations. Each station was arranged so that a child working at one station could not view other stations at the same time. The first station included a product display and materials for a warmup task to acquaint children with study procedures. The second station included the product display and materials for the initial choice set. The third and fourth stations included the product displays and materials for the expanded milk set and expanded juice sets, with the order of appearance counterbalanced across interviewing rooms. The manner in which beverages were displayed within each choice set was controlled, with half of the interviewing rooms containing displays with beverages grouped by product category and the other half containing displays with beverages presented in a random order. 1 The fifth station included a product display and materials for the sorting task.

After arriving at one of the interviewing rooms, children were seated at the first station and given the following instructions:

We are talking to kids like you to find out what kinds of things you like to drink. To do this, we are going to play several games. For each game, we are going to show you a number of different things you might like to drink. We want you to look carefully at the drinks and tell us which one you would pick as your favorite. Then we are going to give you 16 coins of play money (interviewer shows coins). Each coin is worth one bottle of any drink you want. We want you to place these coins next to the drinks you want the most. If you want one bottle, put one coin by that drink (interviewer demonstrates). If you want two bottles, put two coins by that drink (interviewer demonstrates). If you want more bottles, like 5 or 6 or 7 bottles, just put more coins next to the drink. You can put all the coins on one drink or you can split your coins between as many different drinks as you want. The only rule for the game is that you have to use all your coins—you can’t keep any of the coins for yourself.

At this point, children were given the warmup task to ensure they understood the instructions before proceeding. The children were shown a display of beverages other than those included in the primary study. The display included some drinks that children typically like (cola and lemonade) and some that children typically like less or dislike altogether (tomato juice and water). Interviewers identified each beverage by name and asked children to repeat the names to ensure that children could identify the beverages without having to read the labels. After children had correctly identified the beverages, they were asked to pick their favorite beverage from the display as a warmup for the major choice task that followed. They were then given 16 coins and asked to indicate their beverage choices by using the coins, with each coin described as being worth one bottle of a desired beverage. Interviewers asked several followup questions to assess the children's understanding of the instructions (e.g., “You put most of your coins next to lemonade. Is this the drink you like best of all?”). If a child failed to understand the instructions, the instructions and warmup were repeated.

After the warmup, children proceeded to the next three stations. At each station, interviewers identified each beverage by name and asked the children to repeat the names. Children then were asked to pick their favorite beverage and select a set of their favorite beverages by using the 16 coins.

The fifth experimental station was the final stop for children in the study. The children were shown a display of the eight beverages used in the study and given eight paper plates. They were then instructed to “put the drinks that go together, the drinks that are like each other, on the same plate next to each other.” They were allowed to use as many plates as they wanted to avoid restrictions on the number of groups they formed (for a similar method and rationale, see Whitney and Kunen 1983). After completing their groupings, the children were thanked and returned to their parents.

1The arrangement of beverage displays was originally incorporated as an independent variable in the experimental design. Because of the failure of this manipulation to affect children's recognition of category boundaries as expected, and the fact that it did not significantly affect any of the dependent variables by itself or in interaction with other factors, this variable is omitted from the discussion. The data have been collapsed across this factor for all analyses reported here unless noted otherwise.
Dependent Variables

Category shares. Shares for the milk and juice categories were computed by examining the number of coins each child allocated to the milk and juice items for each choice set. The numbers of coins allocated to individual milk items for each choice set—the initial set, expanded milk set, and expanded juice set—were summed to represent the category share for milk for each choice set. Similarly, the numbers of coins allocated to individual juice items were summed to represent the category share for juice.

Choice model fit. To examine the fit of different choice models for children of different ages, children's actual coin allocations for each category in the extended milk set and the extended juice set were compared with choice probabilities predicted by the Luce model and a contextual choice model. To do so, we first constructed a Luce model and a contextual choice model for each child in the study. On the basis of each child's coin allocations in the initial choice set, predictions of category shares for the milk and juice categories were made for both of the extended choice sets. These predictions were compared with children's actual coin allocations to determine which of the models characterized children's choices in the best fashion. Specifically, predictions from the contextual choice model were compared with predictions from the Luce model to evaluate whether or not the contextual choice model offered any positive improvement over the Luce model in terms of predicting actual choices. On the basis of this comparison, children were classified as behaving in a manner presumed by a Luce model or as presumed by a contextual choice model (see Appendix for mathematical details of the models and their comparison).

Recognition of category boundaries. Children's recognition of category boundaries was assessed by asking them to sort the eight experimental products into groups. Each child's sort was examined to determine whether milk beverages were grouped separately from juice beverages. Distinctions of this type could be accomplished in two ways. Children could form one group containing only milk items and a second group containing only juice items or they could form more than two groups, as long as no milk items appeared in the same grouping as juice items. Such a pattern might occur, for example, if a child were to break up the milk category into two subcategories, such as regular milk and flavored milk (chocolate, strawberry, vanilla). As long as children sorted milk items separately from juice items, they were identified as correctly sorting by product category.

RESULTS

Age Differences in Categorization

Differences between age groups were expected to emerge in children's ability to recognize product class boundaries between the milk and juice categories (H.). The percentages of children sorting milk items sepa-

---

5 The percentage of children sorting by product category, and corresponding z-tests for proportions, are based only on subjects exposed to product displays with beverages arranged in random order.

The p-values shown here have been corrected for a rise in error rate due to multiple comparisons by using the formula \( p = \frac{1 - (1 - \alpha)^n}{n} \) where \( n \) is the number of comparisons in which each percentage is involved.

---
Table 1
MEANS (STANDARD DEVIATIONS) FOR COIN ALLOCATIONS: INITIAL CHOICE SET AND NEW ALTERNATIVES

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Coins allocated to milk</th>
<th></th>
<th>Coins allocated to juice</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Initial set</td>
<td>New alternatives</td>
<td>Initial set</td>
<td>New alternatives</td>
</tr>
<tr>
<td>4–5</td>
<td>9.20</td>
<td>6.06</td>
<td>6.80</td>
<td>8.58</td>
</tr>
<tr>
<td></td>
<td>(4.67)</td>
<td>(4.60)</td>
<td>(4.67)</td>
<td>(4.35)</td>
</tr>
<tr>
<td>6–7</td>
<td>9.34</td>
<td>4.34</td>
<td>6.66</td>
<td>7.96</td>
</tr>
<tr>
<td></td>
<td>(3.30)</td>
<td>(3.90)</td>
<td>(3.30)</td>
<td>(3.87)</td>
</tr>
<tr>
<td>9–10</td>
<td>8.71</td>
<td>3.13</td>
<td>7.29</td>
<td>6.63</td>
</tr>
<tr>
<td></td>
<td>(3.06)</td>
<td>(3.59)</td>
<td>(3.06)</td>
<td>(3.19)</td>
</tr>
<tr>
<td>11–12</td>
<td>8.16</td>
<td>2.51</td>
<td>7.84</td>
<td>6.05</td>
</tr>
<tr>
<td></td>
<td>(2.75)</td>
<td>(3.43)</td>
<td>(2.75)</td>
<td>(3.25)</td>
</tr>
</tbody>
</table>

These choice set contrasts, additional contrasts were performed on the age factor to test whether differences observed among age groups were in the predicted direction, with younger children exhibiting larger increases in extended category shares than older children. For this purpose, polynomial contrasts between age groups were performed to examine whether or not there was a trend for share gains among extended categories to become smaller with increasing age (linear trend).

The results, reported in Table 3, strongly support the first hypothesis that the linear contrast for the age factor is significant when we compare differences in coin allocations (shares) between the initial choice set and the expanded milk set as well as between the initial choice set and the expanded juice set. The addition of new alternatives in either the milk category or the juice category increased share for the extended product category, and decreased share for the competitive product category, to a greater extent for younger than for older children. H2 is thus supported.

Choice model comparisons. The extent to which different choice models would capture children’s choice behavior was expected to vary as a function of the child’s age (H3). As children mature, a contextual choice model was expected to predict children’s choice behavior better than a Luce model. To examine this hypothesis, children were classified according to which of the two choice models afforded the best fit to actual choice behavior as new alternatives were added to the milk category and the juice category. The percentages of children for whom the Luce model provided the best fit, categorized by experimental conditions, are reported in Table 4. Children for whom the contextual choice model provided the best fit make up the remaining percentages of children in each condition.

Inspection of Table 4 suggests that the contextual choice model provided a better fit for older than for younger children, at least in the case of predicting choice behavior when new alternatives were added to the milk category. This possibility was examined further by analyzing the percentages of children fitting the contextual choice

---

Table 2
MEANS (STANDARD DEVIATIONS) FOR COIN ALLOCATIONS: INITIAL AND EXPANDED CHOICE SETS

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Coins allocated to milk</th>
<th></th>
<th>Coins allocated to juice</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Initial set</td>
<td>Expanded milk set</td>
<td>Initial set</td>
<td>Expanded juice set</td>
</tr>
<tr>
<td>4–5</td>
<td>9.20</td>
<td>11.92</td>
<td>6.80</td>
<td>12.40</td>
</tr>
<tr>
<td></td>
<td>(4.67)</td>
<td>(4.12)</td>
<td>(4.67)</td>
<td>(3.55)</td>
</tr>
<tr>
<td>6–7</td>
<td>9.34</td>
<td>10.68</td>
<td>6.66</td>
<td>11.38</td>
</tr>
<tr>
<td></td>
<td>(3.30)</td>
<td>(3.48)</td>
<td>(3.30)</td>
<td>(3.72)</td>
</tr>
<tr>
<td>9–10</td>
<td>8.71</td>
<td>10.35</td>
<td>7.29</td>
<td>10.60</td>
</tr>
<tr>
<td></td>
<td>(3.06)</td>
<td>(3.31)</td>
<td>(3.06)</td>
<td>(3.07)</td>
</tr>
<tr>
<td>11–12</td>
<td>8.16</td>
<td>9.24</td>
<td>7.84</td>
<td>11.38</td>
</tr>
<tr>
<td></td>
<td>(2.75)</td>
<td>(3.29)</td>
<td>(2.75)</td>
<td>(2.68)</td>
</tr>
</tbody>
</table>

Note that the presence of age differences in choices of new alternatives does not confound our hypotheses about age differences in choice behavior. Our interest is in the way choices of existing items are affected by choices of new alternatives, regardless of the number of new alternatives selected.
Table 3
ANALYSIS OF COIN ALLOCATIONS: CONTRASTS BETWEEN CHOICE SETS AND AGE GROUPS

<table>
<thead>
<tr>
<th>Effect</th>
<th>F</th>
<th>d.f.</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial vs. expanded milk set</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linear trend</td>
<td>3.79</td>
<td>1</td>
<td>.05</td>
</tr>
<tr>
<td>Quadratic trend</td>
<td>.59</td>
<td>1</td>
<td>.44</td>
</tr>
<tr>
<td>Cubic trend</td>
<td>1.13</td>
<td>1</td>
<td>.29</td>
</tr>
<tr>
<td>Initial vs. expanded juice set</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linear trend</td>
<td>9.88</td>
<td>1</td>
<td>.01</td>
</tr>
<tr>
<td>Quadratic trend</td>
<td>.63</td>
<td>1</td>
<td>.43</td>
</tr>
<tr>
<td>Cubic trend</td>
<td>.83</td>
<td>1</td>
<td>.36</td>
</tr>
</tbody>
</table>

*Boxes indicate hypothesized effects.

Table 4
PERCENTAGES OF CHILDREN FITTING THE LUCE CHOICE MODEL

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Initial vs. expanded milk set</th>
<th>Initial vs. expanded juice set</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>78.0</td>
<td>84.0</td>
</tr>
<tr>
<td>6–7</td>
<td>56.6</td>
<td>84.9</td>
</tr>
<tr>
<td>9–10</td>
<td>44.2</td>
<td>76.9</td>
</tr>
<tr>
<td>11–12</td>
<td>40.0</td>
<td>87.3</td>
</tr>
</tbody>
</table>

model in a log-linear analysis for each of the expanded choice sets. As before, we tested differences between age groups by using polynomial contrasts to detect a trend toward the contextual choice model providing a better fit with increasing age (linear trend). The results, reported in Table 5, partially support this hypothesis in that the linear trend for the age factor is significant when we consider choices for the expanded milk set but is insignificant when we examine choices for the expanded juice set. A trend exists for the contextual choice model to provide a better fit than the Luce model as children grow older when new milk, but not new juice, alternatives are added to the initial choice set. That is, older children's choices of new milk items resulted in greater share losses for the milk than for the juice category, as predicted, but their choices of new juice items resulted in proportionately equal share losses for both categories.

The most likely explanation for this divergence in results can be found in the nature of the expanded milk and expanded juice sets. Items in the expanded milk set were similar to one another, constituting a rather tight category, whereas items in the expanded juice category were relatively dissimilar to one another. The milk items had the same basic composition and texture, no matter what flavoring was added, whereas the juice items varied in terms of acidity (e.g., orange juice vs. grape juice), sweetness (e.g., apple juice vs. cherry juice), and texture (e.g., apple juice is light whereas grape juice is heavy). It seems plausible that older children readily picked up on the similarity between the new and existing items in the expanded milk set, but did not always recognize the lesser similarity between new and existing items in the expanded juice set in making their choices. Though they did so to some degree, given the fact that the share gains for the extended juice category were indeed lower for older than for younger children, their responses were not different enough from a proportionality scheme to warrant the need for a contextual choice model. Thus, H3 receives partial support.

DISCUSSION

Our findings document the existence of age differences in children's choice behavior when children are faced with the introduction of new alternatives into an existing set of products. First, the addition of new alternatives to a product category increases share for that category, and decreases share for competitive product categories, to a greater extent among younger than older children. Second, children's choices from expanded product sets tend to be captured best by different types of choice models at different ages. In particular, younger children's choices can be modeled adequately by a simple Luce model, whereas older children's choices sometimes require the use of more sophisticated contextual choice models.

These data on age differences in children's choice behavior have the potential to improve our basic understanding of how children make choices at different ages and to improve managerial strategies for researching and responding to the children's market. These topics are now discussed in detail.

Theoretical Implications

Our results suggest a basic developmental progression in the way children respond to new alternatives, from behavior characterized by a proportionality scheme to behavior more consistent with a similarity scheme. As children grow older, the tendency to factor in the similarity between new and established products in the choice
set increases, with gains by a new product being offset primarily by losses among established products most similar to it. Younger children, in contrast, tend to ignore the similarity between new and established products in the choice set, with gains by new products being offset on a more or less equal basis by losses among all established products, regardless of their similarity to the new entrant.

These trends appear to be related, at least in part, to age differences in children’s abilities to recognize and incorporate product class similarity into the choice process. Our data indicate that younger children, who are least likely to offset the choice of new alternatives in a product category by penalizing existing products in the same category, are also least likely to recognize product category boundaries in a choice set. Older children, who are most likely to offset the choice of new alternatives in a product category by penalizing existing products in the same category, are also most likely to recognize product category boundaries in a choice set. Thus, age differences in category knowledge appear to be linked clearly with age differences in children’s choice behavior.

Our explanation for age differences in children’s choice behavior is not only consistent with our findings, but also provides a more viable scenario than several others that might be proposed. First, one might propose that the age differences observed here are due simply to younger children having less stable product preferences than older children. Thus, changes in category shares for the expanded product categories would not be due to younger children failing to incorporate product class similarity into the choice process, but rather to momentary fluctuations in younger children’s preferences. Our data, however, suggest otherwise. The fact that share gains for extended categories were greater for younger children across two different settings, expansion of the milk category and expansion of the juice category, greatly reduces the possibility that momentary fluctuations in younger children’s preferences produced the same pattern of findings twice. Furthermore, even if one believes that instability could be a contributing factor if not a determining factor in age differences, our explanation provides a more parsimonious interpretation for the findings in that it is also capable of accounting for the instability notion. The underlying reason for the apparent instability of young children’s choices across choice occasions is precisely that they lack or do not utilize an internal frame of reference for comparing products on a consistent basis, a frame of reference often provided by well-developed categorization schemes.

Second, one might propose that age differences are not caused by younger children failing to consider product class similarity in the choice process, but by the fact that younger children simply use some other definition of product class similarity than that commonly used by older children and adults. Thus, age differences in share gains might be due to younger children having a different basis for judging class similarity than the standard one imposed here (milk vs. juice). Though such an occurrence is theoretically possible, and is difficult to rule out altogether, our data suggest that it is an improbable explanation for the results. Looking at the sorting data for younger children, guided by several informal interviews with children conducted after the sorting task, we fail to find any categorization scheme that dominates the way items were sorted in the choice set. For example, several children appear to have sorted by the only perceptual cue available to them, color. Other children appear to have sorted by usage situations, such as beverages used at breakfast (milk and orange juice) versus beverages used for snacks (chocolate milk and grape juice). A third set of children seem to have sorted by preference, putting items they preferred into one group and items they did not like into another group. Finally, a large number of children sorted in ways that do not appear to have any consistent basis. With such diversity in the way children grouped the items, it hardly seems plausible that all of the different patterns could have produced the consistent effects on category share gains found for children in this age group. However, the idea that different definitions of product class similarity might produce age differences in choice is still an intriguing one that warrants further examination.

Managerial Implications

On an applied level, our findings suggest that firms should consider age differences in children’s choice behavior in developing marketing strategies and applying research techniques. In designing marketing strategies, recognition of the type of age differences found here suggests an opportunity for targeting new products to the younger end of the children’s market. The observation that younger children’s choices of new products are not accompanied by equally substantial losses to existing items in the same category implies that market shares for new products can be gained not only at the expense of direct competitors in the same product category, but also at the expense of indirect competitors in related product categories. Thus, the prospects of success may be enhanced for a new product that faces heavy competition in its own product category but relatively light competition from brands in other categories. Note, however, that this pattern of choice behavior among younger children also poses a particular risk for firms subject to competitive threats from new products introduced by other firms. For an established brand targeted to young children, market share may well decline not from competitive entries in the same category, but from unusually heavy new product activity in related categories.

Similarly, age differences in the way children make choices should be more widely recognized in the selection and application of research techniques. In particular, our results point to two suggestions in the area of
choice modeling and forecasting, areas of children’s research that have not been actively addressed to date. In general, our data suggest a problem with aggregating responses across age groups in order to estimate choice models or forecasting models. Instead of estimating models on the basis of aggregate data obtained from samples of children 4 to 12 years or 6 to 12 years of age, it may be that responses need to be modeled separately for different age segments and then aggregated.

More specifically, our data suggest that different types of choice models may be more or less appropriate for children of different ages. This suggests that researchers should match the complexity of choice models to the ages of children being studied. Young children’s choices can be modeled with rather simple non-context-dependent models, such as a Luce model. Because context effects do not need to be explicitly accounted for, the measurement procedures used to establish such models are also quite simple (e.g., monadic ratings and paired comparisons). However, older children’s choices may need to be modeled with more complex contextual choice models, especially in those instances where interobject similarity is salient to these children. In this case, because context effects must be considered explicitly, measurement procedures will need to be more complex in order to estimate the choice model (e.g., a full choice experiment with comparisons between all possible combinations of choice alternatives in pairs, triples, quadruples, etc.; see Louviere 1988). Hence, matching the type of model to the age of the child concerned will not only afford better predictions, but also simplify the measurement procedures needed to estimate choice models whenever possible.

Further inquiry into these possibilities would contribute not only to improved research methods, but also to our understanding of how children of different ages make consumer choices. Because of children’s important role in the marketplace, and the ever-expanding range of products available to them, the topic of children’s choice behavior could not be more timely nor more significant than it is now.

APPENDIX

CHOICE MODEL SPECIFICATION
AND COMPARISON

We show here the specification of alternative choice models to test for the hypothesized categorization effects through changes in choice shares resulting from changes in the set of beverages considered for choice.

Let $M$ be the set of milk beverages, $J$ the set of juice beverages, and $R = M + J$ the complete set of beverages considered in a choice occasion.

Let $P(x; R)$ be the probability of choice of a beverage $x$ in the set $R$, either as predicted by a choice model or observed as a proportion of coin allocations. Thus,

$$P_M = \sum_{x \in M} P(x; R)$$

and

$$P_J = \sum_{y \in J} P(y; R)$$

are the choice shares of milk and juice, respectively.

**Luce Model Predictions**

If no categorization scheme is used, each beverage is assumed to be chosen in proportion to an intrinsic utility value for that beverage ($V$), and its choice probability is given by the Luce (1959) model as

$$P(x; R) = \frac{V(x)}{\sum_{y \in R} V(y)}.$$

If a new beverage $z$ is added to the choice set, the Luce model would predict new shares for beverages in the initial choice set as

$$P'(x; R + z) = P(x; R)[1 - P(z; R + z)].$$

In other words, all the beverages in $R$ lose share to $z$ in proportion to the share they each had before $z$ was added to the choice set.

**Contextual Choice Model Predictions**

If a categorization scheme is used, choices are assumed to be made first in proportion to an intrinsic utility value for a category ($U$) and second in proportion to utilities for individual beverages within each category.

If the set of beverages $R$ is partitioned into two nonoverlapping categories, $M$ (milk) and $J$ (juice), the choice probability of a milk beverage, $x \in M$, is given by the contextual choice model as

$$P(x; R) = \frac{U(M)}{U(M) + U(J)} P(x; M).$$

If a new beverage $z$ is added to the choice set $R$, the contextual model would predict new shares for the beverages in the initial choice set as

$$P'(x; R + z) = P(M, R)P(x; M + z)$$

$$= P(M, R)P(x; M)[1 - P(z; M + z)]$$

if $z$ is a milk beverage

$$= P(M, R)P(x; M)$$

if $z$ is a juice beverage.

Thus, if a beverage $z$ is added to $R$, only the beverages in the same category as $z$ will lose share proportionately in relation to other beverages in the same category.

**Choice Model Comparison**

To test a hypothesized category structure, such as milk versus juice, against no structure, one can compare observed share changes with those predicted by the Luce model (equation A4) and the contextual choice model (equation A6).

The proportions on the right sides of equations A4 and A6 are observed in the experiment for each subject, enabling us
to compute predicted proportions for each beverage in the extended sets according to the Luce and contextual choice models (left sides of equations A4 and A6). Following equations A1 and A2, we then compute the corresponding category proportions for milk and juice.

Let $P_{mi}$ and $P_{ji}$ be actual proportions of coins allocated to the milk and juice categories, respectively.

Let $P_{Mi}$ and $P_{Ji}$ be the proportions of coins allocated to the milk and juice categories as predicted by the Luce model (equation A4).

Let $P_{Mi}$ and $P_{Ji}$ be the proportions of coins allocated to the milk and juice categories as predicted by the contextual choice model (equation A6). Then,

$$I(C,L) = \sum_{i=M,J} P_{Mi} \log \frac{P_{Mi}}{P_{Li}}$$

(A7)

is an information theoretic measure of the improvement (see Urban and Hauser 1980) of the contextual choice model over the Luce choice model in predicting the observed coin allocations. $I(C,L) < 0$ indicates that the Luce model fits best for an individual subject.

REFERENCES


