Adding Asymmetrically Dominated Alternatives: Violations of Regularity and the Similarity Hypothesis

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An asymmetrically dominated alternative is dominated by one item in the set but not by another. Adding such an alternative to a choice set can increase the probability of choosing the item that dominates it. This result points to the inadequacy of many current choice models and suggests product line strategies that might not otherwise be intuitively plausible.

A n important issue in marketing is understanding how the introduction of a new brand into a market will be reflected in choice probabilities or market shares. A standard model used in such situations is to assume that a new offering will take from others in proportion to their original shares. This assumption of proportionality is incorporated in the Luce (1959) model of choice and is central to a number of models of consumer behavior. For example, Pessemier et al. (1971) and Reibstein (1978) use this assumption as a basis for transforming affect scores into choice probabilities for soft drinks, while Silk and Urban (1978) use a similar method to predict share for packaged goods. The assumption has also been central to models of college choice (Punj and Staelin 1978) and transportation mode choice (McFadden 1974).

It is not hard, however, to identify situations in which the assumption of proportionality fails (Debreu 1960; McFadden 1974). Generally, there is agreement that a new product takes disproportionately more share from those similar to it than from dissimilar items. This idea, which has come to be called the similarity hypothesis (Tversky 1972), is reflected in the managerial belief that one can minimize cannibalization by designing a new product to be as dissimilar from the firm's current offerings as possible. The similarity hypothesis has served as a basis for a number of alternative theories of choice (Tversky 1972; Hauseman and Wise 1978; Batsell 1980; McFadden 1980). These

models are increasingly being used to aid marketing managers making marketing entry decisions (e.g., Urban, Johnson and Brudnick 1980).

While substantially different in their underlying assumptions, the Luce choice model and the proposed revisions do share a common assumption that the addition of a new alternative cannot increase the probability of choosing a member of the original set. This condition, called regularity, is necessary for the validity of most probabilistic choice models and has been found to hold empirically.

It will be shown that both the similarity hypothesis and the regularity condition can be consistently violated by the addition of an asymmetrically dominated alternative. An alternative is "asymmetric" if it is dominated by at least one alternative in the set but is not dominated by at least one other. We show that the addition of such alternatives increases the share of the item that dominates it, thus violating regularity. Furthermore, since the new alternative is typically closest to the item that dominates it, this result implies that the new alternative set "helps" the items closest—a reversal of the similarity hypothesis, which would predict the opposite.

If accepted, the results have managerial and theoretical importance. Managerially, the results lead to the counterintuitive conclusion that there are times when profitability of a product line can be increased by adding a (dominated) alternative that virtually no one ever chooses. The effect of the dominated alternative is to draw attention to a more profitable item rather than to generate direct sales. Theoretically, the results indicate that there is a limit to the range of applicability of most discrete choice models. These models will either have to be modified to accept the distortion of dominated items or limited in their range to collections without dominated alternatives. Furthermore, the

results have implications for those who estimate the similarity effect (e.g., Batsell 1982). These researchers may wish to include a term that accounts for the dominance structure of the subsets. If such a term is not included, the similarity effect may be artificially attenuated, since its effect is reversed when dominance is present.

The present paper is organized as follows: the concepts of regularity, similarity, and dominance are briefly reviewed, and a method is presented that tests the hypothesized violations; some explanations are provided that may account for these expected violations; and the results are examined with respect to the explanations they support and the future research they suggest.

Regularity and Choice Models

Regularity is a minimum condition of most existing choice models. Formally, for any item that is a part of set A where A is, in turn, a subset of B, the probability of choosing X from A must not be less than from B, or for all $x \in A \subseteq B$,

$$Pr(x;A) \geq Pr(x;B)$$

If this inequality is satisfied, one cannot increase the probability of choosing an item by adding other items. Regularity is a rather weak condition that is required by both Luce's (1959) choice model and by Tversky's (1972) elimination-by-aspects model. Empirically, it has been found to be satisfied. For example, Becker, DeGroot, and Marshak (1963) found that, in choices among gambles, regularity was satisfied even though proportionality was not. Luce summarized by remarking that the "only property of general choice probabilities that has not been empirically disconfirmed is regularity" (1977, p. 229).

On the other hand, it is easy to think of examples that violate regularity, particularly if higher-order rules are imposed on the decision. Corbin and Marley (1974) give two such examples. The first involves a woman in a small town who must decide between two hats. In this case, the probability of choosing a hat would decrease if its duplicate were also available. Presumably, the woman would not want a hat someone else could buy. Thus, the probability of purchasing a hat could increase if one of its competitors were duplicated, violating regularity. The second example concerns the probability of choosing an entree where the decision rule is to choose from a set excluding the most expensive. The probability of choosing the most expensive entree could then be increased by simply adding one to the list that is more expensive still. Note that both of these exceptions involve higher-order rules for which the value of alternatives depends on the choice set. That is, one must postulate a rule concerning the desirability of having a unique hat or the undesirability of the most expensive entree for these exceptions to be plausible.

The exceptions to regularity we shall illustrate do not depend on the existence of such higher-order rules. Moreover, the effect will be shown to occur in a number of different product categories.

Relative Similarity and Choice Models

As noted earlier, the similarity hypothesis asserts that a new alternative takes disproportionate share from those with which it is most similar. Researchers have shown that the similarity effect is operant for individual (Rumelhart and Greeno 1971) or aggregate (Huber and Sewall 1978) choice probabilities. Unfortunately, as Luce and Suppes (1965) show, the similarity hypothesis is logically incompatible with both constant utility and independent random utility models of choice.

Accordingly, several authors have attempted to modify these choice models to allow for the similarity effect. For example, working with a random utility framework, Hauseman and Wise (1978) modified the Thurstone model to accept covariances between alternatives. The similarity effect can then be represented by a positive covariance in the preferences among similar alternatives. Tversky's (1972) elimination-by-aspects model, arising as a multinominal generalization of Restle's (1961) model, accounts admirably for the similarity effect. Finally, work by Batsell (1980) provides a procedure for directly accounting for the similarity effect on choice probabilities from different choice sets.

In all of these modifications, the addition of an alternative lowers the choice probability of similar items proportionately more than dissimilar ones. As will be shown, however, the addition of a dominated alternative appears to have the opposite effect, increasing choice of the similar item that dominates it. Further, this effect is stronger as relative similarity increases, thus limiting the applicability of the similarity hypothesis to choice sets in which such dominance does not occur.

Dominance and Choice Models

Dominance is not easily modeled by most choice models. For example, it is easy to show that the existence of an asymmetrically dominated alternative in a choice set implies that pairwise probabilities cannot be modeled by either a constant or a random utility choice model. In both models, the probability of one item being chosen over another is a function of their distance on a one-dimensional utility scale. Dominated items, having zero probability of being chosen, are represented in the limit as being an infinite distance below those items that dominate them. The contradiction arises in that distances among nondominating pairs (with pairwise probabilities that do not equal zero or one) must be finite. In the asymmetric case, then, there can be no one-dimensional scale that simultaneously accounts for the finite and infinite distances implied by the paired probabilities.

Previous models of choice have handled the issue of dominated alternatives in a number of ways. Both Restle's model (1961) and elimination by aspects (Tversky 1972) account quite well for extreme probabilities. Since the probability of choosing an item is a function of its unique aspects, a dominated alternative lacking unique aspects has

no probability of being chosen. Luce (1959) simply re-
stricted the choice set to nondominated alternatives. Con-
sequently, many of the subsequent tests of choice models
have not included dominated alternatives. It can also be
reasonably argued that respondents initially delete domi-
nated alternatives, leaving the choice along the efficient
frontier unaffected (Coombs and Avrunin 1977). However,
as will be shown, the very presence of the dominated al-
ternative results in quite different choice probabilities
among the remaining alternatives than in the pristine state,
where such items are never considered.

To summarize, the purpose of this paper is to demon-
strate violations of regularity and the similarity hypothesis
due to the addition of an asymmetrically dominated alter-
native. These violations will be illustrated in the context of
a particularly simple product choice task.

METHOD

One hundred and fifty-three students in graduate and un-
dergraduate business classes were asked to make choices
from among six product categories: cars, restaurants, beers,
lotteries, film, and television sets. Decisions involved either
two or three alternatives, with each alternative defined on
two attributes. This provided a simple decision environment
and a straightforward test of the hypotheses. The alterna-
tives in each product class were designed to represent a
target, a competitor, and a decoy, as shown in Figure A.
The target and the competitor are positioned so that neither
dominates the other—each has a dimension on which it is
superior. The decoy is then a stimulus anywhere in the
shaded region of Figure A where it is dominated by the
target but not the competitor.

The test of the effect of the decoy was made by com-
paring the percentage of times the target was chosen against
the competitor with and without a decoy present. This test
was performed within subjects by having a subset of the
students repeat the task two weeks later with the decoys
removed. Across respondents, the test was made by posi-
tioning the decoy in different corners of the space for
matched groups. Thus the decoy effect is the difference in
shares for an item when it is the target, as opposed to the
times when the competitor takes that role.

Why Decoys Can Be Expected to Distort Choice

Before examining the results of the experiment, it is use-
ful to consider reasons why the addition of an asymmetri-
cally dominated alternative (decoy) increases the proportion
of choices in favor of the target. Notice first that, if the
added dominated alternative is *never* chosen, then any
change in the proportion of choices between the target and
the competitor is a technical violation of regularity (since
the probability of choosing one of the original options in-
creases). Such violations of regularity would be rather un-
interesting even if they could be shown to be statistically
significant. In the present case, however, the prediction is

FIGURE A

PLACEMENT OF ASYMETRICALLY DOMINATED DECOY
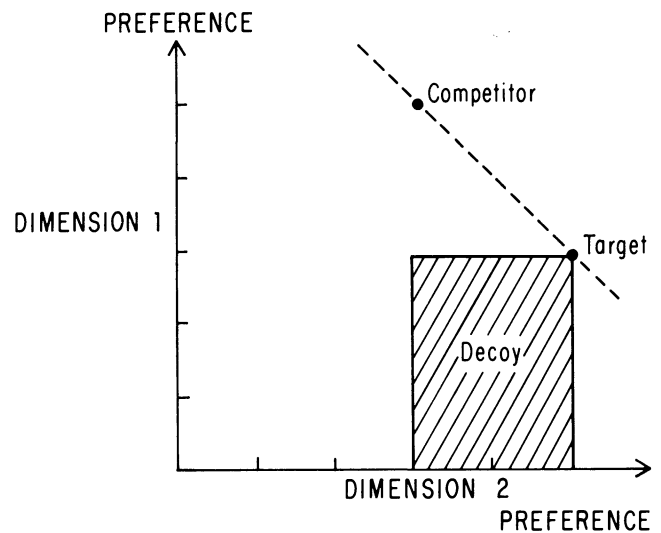
directional—adding the decoy is hypothesized to *increase*
the percent of choices to the target, violating regularity in
a predicted direction and, since decoys are typically closer
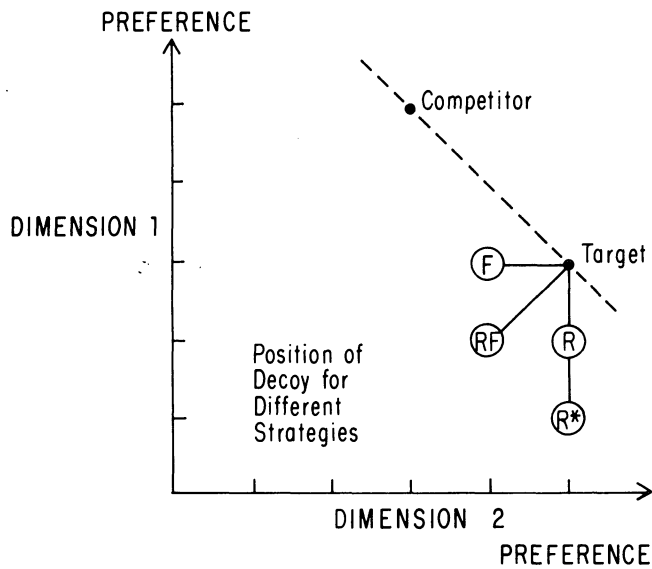to targets than competitors, reversing the similarity effect.

There are several, possibly interacting reasons why a
decoy placed in the shaded region of Figure A might be
expected to increase the share of the target at the expense
of the competitor. These reasons include the perceptual
framing of the decision problem and the evaluation pro-
cesses used. Consider the effect of the four decoy placement
strategies shown in Figure B on weighting of attributes and
scaling of alternatives. Figure B provides a graphical de-
scription of the strategies, while Table 1 gives examples of
each strategy, with sixpacks of beer as the choice options.

The four strategies have the effect of (1) increasing the
range of the dimension on which the target is weakest, R;
(2) strongly increasing that range, R^*; (3) increasing the
frequency of the dimension on which the target is superior,
F; and (4) combining both a range and a frequency strategy,
RF. Increasing the range of the dimension on which the
competitor is superior is hypothesized to decrease the im-
portance of a fixed difference on that dimension. Thus in
the example given, the increase in the range of quality from
20 to 30 points may make the 20 point advantage of the
competitor over the target seem less extreme. Such an effect
would be similar to the result that increasing the range of
stimuli tends to narrow the category ratings on that dimen-
sion (Parducci 1974). Notice further that a range effect
would predict that an increase in the range *(R* versus R^**)*
would increase the biasing effect, thus permitting an eval-
uation of the efficacy of this explanation.

Increasing the frequency of items along the dimension
on which the target is superior might increase the weight
of that dimension. Such an effect could occur in two ways.

FIGURE B

DIFFERENT DECOY PLACEMENT STRATEGIES[a]

TABLE 1

EXAMPLES OF CHOICE SETS FOR DIFFERENT STRATEGIES

	Price/ sixpack	Quality rating
Range increasing (R)		
Target	$1.80	50
Competitor	$2.60	70
Added decoy	$1.80	40
Extreme range increasing (R*)		
Target	$1.80	50
Competitor	$2.60	70
Added decoy	$1.80	30
Frequency increasing (F)		
Target	$1.80	50
Competitor	$2.60	70
Added decoy	$2.20	50
Range-frequency (RF)		
Target	$1.80	50
Competitor	$2.60	70
Added decoy	$2.20	40

First, by adding another price level, more attention may be drawn to the dimension (Currim, Weinberg, and Wittink 1981). Second, the addition of a beer with a price of $2.20 might tend to spread the psychological distance of the 80¢ price advantage the target has over its competitor. Adding such a decoy would lower the variance along the price dimension, thus making the standardized differences greater. This result is once again analogous to Parducci's (1974) findings that adding alternatives within the range of others tends to spread out their distances on subjective category ratings.

The combination range-frequency strategy, RF, adds a decoy that simultaneously increases the range of the dimension on which the target is inferior and increases the frequency on which it is superior. Although such a strategy should combine the biasing powers of both, as the example in Table 1 makes clear, it may be harder to detect dominance if one must consider both dimensions. Thus the biasing effect may be attenuated with such a strategy.

Finally, a reweighting to favor the target could occur simply because of a misplaced popularity inference on the part of the respondent. Before being aware of the dominance relations in the set, a subject may believe that all of the choices are popular, viable options. However, if the subject wishes to make a choice that others would make, the belief that the decoy is popular may shift votes toward the target.

In addition to perceptual types of effects discussed previously, there are certain evaluation strategies which, if followed, would bias choice towards the target in the presence of the decoy. Suppose the choice process involves a series of paired comparisons and that each pair is evaluated on an attribute-by-attribute basis (Russo and Rosen 1975). Under such an evaluation process, an initial pairing of the decoy with the competitor could eliminate the competitor so that it could no longer compete, thereby increasing the target's probability of being chosen. A more subtle form of this process would involve a round-robin tournament in which each stimulus is compared with all other stimuli in the set and the item with the most wins is chosen. If subjects either count the number of wins or the number of attribute wins (cf. Russo and Dosher 1980), then it is easy to show that addition of the decoy helps the target.

A consideration of the cost of thinking (Shugan 1980) would also give an advantage to the target. Under the cost-of-thinking model, the hypothesized cost of making decisions between dominated pairs is much less than between nondominated pairs. The easy choice between the target and the decoy might be more likely to be made by the simplifying decision maker than either decision involving the competitor, thus leaving the target as the choice.

In sum, consideration of either perceptual biases or certain evaluation strategies leads one to predict the diversion of choices to the target due to the presence of the dominated decoy. This hypothesized effect, leading to a violation of regularity and a reversal of the similarity effect, is tested on both a between- and a within-subject basis (cf. Einhorn and Hogarth 1981).Within subjects, a count is made of the preference reversals between the target and the competitor due to the decoy. These results are aggregated across six product classes and four placement strategies according to a balanced design detailed in the Appendix. The between-subject analysis estimates the effect of each of the four (R, R*, F, RF) decoy placement strategies across the six product categories. This analysis provides more detail as to the mechanism driving the effects.

RESULTS

Within-Subject Preference Reversals

Two weeks after the initial test, 93 subjects were asked to choose again between the competitor and the target with the decoy removed. Out of the 558 choices (6 product classes × 93 subjects), Table 2 tallies the number of reversed preferences. Two tests were made on the distorting effect of the decoy. The first was based on the 98 percent of the choices in which the decoy was not chosen. In that sample, 63 percent of the 109 reversals (Cells *b* and *d*) were to the target and 37 percent to the competitor. That difference is statistically significant (McNemar Test, Siegel 1956) at a $p \leq 0.05$ level. The second test codes switching to the dominated decoy as switching from the target, thus merging the decoy and the competitor groups (Cells *b, d* and *c*). In that test, 59 percent switched to the target, while 41 percent switched away. The difference was marginally significant at a $p \leq 0.10$ level.

Within subjects, the decoy effect was significant, but not strongly so. Regularity was violated—the target's share jumped from 53 percent to 56 percent with the addition of the decoy. The relative weakness of the distortion can be attributed to a carryover effect in which subjects simply repeated choices made two weeks earlier. Indeed, the cross-subjects analysis, which does not share pretest sensitization, resulted in a much stronger decoy effect.

Between-Subject Share Changes

Between subjects, a test of the decoy effect was made by comparing the change in the proportion of subjects choosing the target over the competitor with different experimental placements of the decoy. Table 3 gives these proportions broken down by the six product classes and the four strategies. For example, looking across the top row, car *A* was chosen 44 percent of the time when there was no decoy but 66 percent of the time when a range increasing *(R)* decoy was added. The second set of columns gives the results when the other car, *B,* was the target. Regularity is violated when the percent choosing the item was greater with the decoy than in the no decoy condition. This occurred in 18 out of the 24 different cases ($p \leq 0.05$). The final column gives the average change due to adding the decoy. This is in the hypothesized direction for all of the product classes and overall has an average value of 9.2 percent. That is, adding the decoy can be expected to increase share over not having any decoy by about 9 percent.

A simple way to summarize the effectiveness of the various strategies is to use Table 3 to compute the average share or gain to the target due to adding the decoy. The two range increasing strategies *(R* and *R*)* increased the average target's penetration by 13 points; next was the range-frequency *(RF)* strategy, with a gain of 8 percentage points, followed by the frequency strategy *(F)* with a net gain of 4 points. A test of the statistical significance of these gains was made by comparing the within-product gain due to a

TABLE 2

INDIVIDUAL CHOICE REVERSALS DUE TO ADDITION OF DECOY

Two-item choice set	Three-item choice set			
	Target	Competitor	Decoy	Total
Target	242 *a*[a] (44%)	40 *b* (7%)	8 *c* (1%)	290 (53%)
Competitor	69 *d* (12%)	190 *e* (34%)	3 *f* (1%)	262 (47%)
Total	311 (56%)	230 (42%)	11 (2%)	552 (100%)

[a] *a, b, c, d, e,* and *f* cells.

strategy. For example, the *R* strategy was tested using a Fisher Exact Test, testing whether the two *R* strategies for beer (each with a different target) could have been drawn from the same population. The tests on both the *R* strategies and the *RF* strategy were significant at $p \leq 0.05$. The frequency increasing strategy was not significant at that level. The same test was used to compare the significance of differences between strategies. Both moderate and extreme range strategies were significantly more effective than the frequency strategy ($p \leq 0.05$), but all other differences were not significant.

Summary of Results

Overall asymmetric dominance appeared to have a strong effect in violating regularity. This effect was stronger (9 points) across subjects than it was within subjects (3 points). The fact that the range increasing strategies produced a 13 point change that did not differ with the degree of the range extension suggests that a simple range extension explanation is not sufficient and that other factors must be found to account for this effect. The weakness of the range-frequency strategy may be due to dominance not being as readily apparent in such situations. Finally, the weakness of the frequency strategy suggests that this strategy is not as successful in revising weights as had been expected; it also indicates that dominance per se may not be as critical as the particular placement of the decoy.

If one defines relative similarity as the ratio of the decoy-competitor distance to the decoy-target distance, then these results follow a definite pattern. The relative similarity of the decoy to the target is greatest for the average of the range increasing strategies and least for the frequency or mixed strategies. Notice, however, that this result reverses the standard similarity hypothesis since the relative similarity to the target is greatest for those decoys (the range strategies) that most help the target.

DISCUSSION

The fact that regularity was found to be violated here but not in other studies can be attributed to earlier choice sets

TABLE 3

SUMMARY OF CHOICE PROBABILITIES FOR ALTERNATIVE DECOY PLACEMENT STRATEGIES

	Probability of choosing target given that:										
	A is target and decoy placement strategy is:					B is target and decoy placement strategy is:					
Product class	No decoy	R[a]	F	RF	R*	No decoy	R	F	RF	R*	Point change due to decoy
Cars	.44	.66	.52			.56		.67	.67		13.0
(n)	(102)	(38)	(33)			(102)		(40)	(36)		
Beer	.43	.63		.35		.57	.75	.67			10.0
(n)	(102)	(39)		(37)		(102)	(38)	(36)			
Restaurants	.30		.21	.43		.70	.91		.87		10.5
(n)	(102)		(39)	(37)		(102)	(34)		(39)		
Lotteries	.75	.81			.68	.25	.41	.18			2.0
(n)	(101)	(36)			(37)	(101)	(37)	(38)			
Film	.24	.20	.19			.76		.84		.92	3.8
(n)	(102)	(40)	(37)			(102)		(37)		(37)	
TV sets	.75		.87		.83	.25	.32			.62	16.0
(n)	(102)		(38)		(35)	(102)	(38)			(37)	
Average	.485			.532		.515			.653		9.2

[a]R = moderate range expanding; F = frequency expanding; RF = range and frequency expanding; R* = extreme range expanding.

not containing asymmetrically dominated alternatives. In earlier tests, the added alternative typically took substantial share from the items in the original set so that a *substitution* effect may have outweighed any *distortion* effect due to the presence of the new alternative. Thus regularity may have been satisfied because the substitution effect, tending to take share away from the original objects, was stronger than any consistent distortion effect in rearranging share. With the asymmetrically dominated alternatives studied here, by contrast, the substitution effect was virtually negligible (2 percent), and so the distortion effect became clearly evident. It should be emphasized, however, that even though a distortion effect may be masked by a substitution effect, it still occurs, and should be part of our models of choice.

The violations of the similarity hypothesis found in this study took two forms. First, to the extent that asymmetrically dominating alternatives tend to be similar to the items they dominate, any help from such items results in a reversal of the standard similarity effect. The second violation of the similarity hypothesis occurred in that those decoys whose relative similarity to the target was greatest had the greatest positive effect on the target. While this last violation must be considered speculative until a more precise measure of relative similarity can be tested, both results together have rather strong implications for the interpretation of any test of the similarity effect. Specifically, if stimulus sets are mixtures of dominated and nondominated alternatives, then the similarity effect is likely to be attenuated because of the reversals due to the dominated alternatives. Thus, such tests should account for this inter-

action with dominance or restrict their applicability to sets of nondominating objects.

These results, while powerful, are limited in their scope. In particular, choice in this experiment was limited to three alternatives per product class defined on two dimensions. It is expected that increasing the complexity of the decision task would increase the error in the choices and thereby limit the effect of adding any alternative. In particular, the effect of dominance per se may be lessened with more alternatives or more dimensions per alternative, simply because it would be harder to recognize. Paradoxically, other effects found—such as the distorting effect of range or frequency of items on each dimension—may be stronger, since these aspects of a choice set may be relatively easy to acquire and use given a quick scan of relatively complex data.

If the results do extend to more complex and realistic task environments, however, the managerial implications of such distortions of choice probabilities could be very important. Consider, for example, the following hypothetical consumer choice situations.

- A store owner has two camel hair jackets priced at $100 and $150 and finds that the more expensive jacket is not selling. A new camel hair jacket is added and displayed for $250; the new jacket does not sell, but sales of the $150 jacket increase.

- A seller of $500 tours to Disney World might also offer a tour to a theme park in Europe costing $2,500. Few tickets for the European tour would be sold, but penetration would increase for the domestic tour.

● A manufacturer of cars with relatively poor gas mileage (e.g., 20 mpg) might decrease the effect of this dimension by first showing prospects a high-powered car in the showroom with much worse (8 mpg) mileage.

The preceding choice situations are interesting because they are not clear cases of dominance, but rather of near-dominance, where the decision from the decoy to the target is easy to make and the range effect favors the target. In terms of the experimental paradigm, such decoys would be positioned just to the right of the R or R* strategies in Figure B.

The examples given previously reinforce the need to validate the dominance effect in the context of actual choice. As an example of such a study, a decoy camel hair coat could be experimentally added to the offerings of a retail firm, and its effect on jacket and total sales measured. Similarly, catalogues provide a particularly fruitful mechanism for field research into the effect of near or totally dominated alternatives. A sample of catalogues can be experimentally modified by adding decoys. Large mailings could then serve as a very powerful test of the phenomenon.

In terms of the development of a comprehensive theory of choice, the empirical results given here cannot be accounted for by current theories of choice represented by the Luce model or its extensions. A unique explanation for the effects found is missing. Research is needed to determine the relative efficacy of various explanations as well as their applicability under different conditions (such as adding more stimuli). Such research could either emphasize tests of weight shifting or more directly examine the evaluation processes. Tests of weight shifting would be more appropriate as a way to examine the range or frequency explanations. Weights could be shown to depend systematically on the placement of the decoys, where the weights could be elicited either by direct or by statistical methods (e.g., Currim, Weinberg, and Wittink 1981). A process-oriented research stream (cf. Payne, Braunstein, and Carroll 1978) could provide the appropriate tests of the validity of the pair comparison explanation. For example, verbal protocols or eye tracking methods might be used to assess the effect of a decoy placement on the order in which pairs are considered. Such results might indicate that decoys alter the implicit choice agenda.

It is likely that a thorough understanding of the phenomena reported here will come as a result of both statistical estimation methods and process tracing methods. The results of such efforts are needed to build a comprehensive theory of choice that explains the empirical results found here, rather than leaving them as exceptions to current theories.

APPENDIX

Detail of Experimental Procedure

I. Sample Choice Problem

Below you will find three brands of beer. You know only the price per sixpack and the average quality ratings made by subjects in a blind taste test. Given that you had to choose one brand to buy on this information alone, which one would it be?

Brand	Price/Sixpack	Average Quality Rating (100 = Best; 0 = Worst)
I	$1.80	50
II	$2.60	70
III	$3.00	70

I would prefer Brand—(Check one only)

I _____   II _____   III _____

II. Attribute Values for Product Categories

Product	Dimension 1					Dimension 2				
Beer:			Price/sixpack					Quality		
Value:	$3.40	3.00	2.60	2.20	1.80	30	40	50	60	70
Level:	1	2	3	4	5	1	2	3	4	5
Cars:			Ride quality (100 = like a Rolls; 60 = like a Jeep)					Gas mileage (mpg)		
Value:	60	70	80	90	100	21	24	27	30	33
Level:	1	2	3	4	5	1	2	3	4	5
Restaurants:			Driving time (minutes)					Food quality (stars)		
Value:	45	35	25	15	5	1	2	3	4	5
Level:	1	2	3	4	5	1	2	3	4	5
Lotteries:			Chance of winning (percent)					Amount of win		
Value:	28	42	56	70	84	$18	27	36	45	54
Level:	1	2	3	4	5	1	2	3	4	5
Film:			Developing time (minutes)					Color fidelity (100 = best)		
Value:	6	4½	3	1½	½	89	91	93	95	97
Level:	1	2	3	4	5	1	2	3	4	5
TV sets:			Percent distortion (0 = Best)					Reliability (Average time to breakdown) (years)		
Value:	4.5	3.5	2.5	1.5	0.5	2	3	4	5	6
Level:	1	2	3	4	5	1	2	3	4	5

III. Assignment of Stimulus (Decoy) to Groups

Product class	Dimension	Levels of each dimension by group (5 = best)											
		Group 1[a]			Group 2			Group 3			Group 4		
		T	C	D	T	C	D	T	C	D	T	C	D
Beer	Strategy		R			R			F			RF	
	D1	3	5	2	5	3	5	3	5	3	5	3	4
	D2	5	3	5	3	5	2	5	3	4	3	5	2
Cars	Strategy		F			F			RF			R	
	D1	3	5	3	5	3	4	3	5	2	5	3	5
	D2	5	3	4	3	5	3	5	3	4	3	5	2
Restaurants	Strategy		RF			RF			R			F	
	D1	3	5	2	5	3	4	3	5	2	5	3	4
	D2	5	3	4	3	5	2	5	3	5	3	5	3
Lotteries	Strategy		R*			F			R			R	
	D1	5	3	5	3	5	3	5	3	5	3	5	2
	D2	3	5	1	5	3	4	3	5	2	5	3	5
Film	Strategy		R			R*			F			F	
	D1	5	3	5	3	5	1	5	3	4	3	5	3
	D2	3	5	2	5	3	5	3	5	3	5	3	4
TV Sets	Strategy		F			R			R*			R*	
	D1	5	3	4	3	5	2	5	3	5	3	5	1
	D2	3	5	3	5	3	5	3	5	1	5	3	5

[a]Read as follows: For the product class Beer, the attribute values for the *Target* were determined by selecting level 3 of Dimension 1 (Price) and level 5 of Dimension 2 (Quality); the attribute values for the *Competitor* were determined by selecting level 5 of Dimension 1 and level 3 of Dimension 2; and the attribute values for the *Decoy* were determined by selecting level 2 of Dimension 1 and level 5 of Dimension 2. Each level is as defined in Section II. of the Appendix. The Strategies are:

R = Moderate Range Increasing
R* = Extreme Range Increasing
F = Frequency Increasing
RF = Range and Frequency Increasing

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