Order of Entry as a Moderator of the Effect of the Marketing Mix on Market Share

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Abstract

Order of entry has been demonstrated to have a significant effect on market share. A number of explanations for this effect have been suggested in the marketing and strategy literatures. To date, the market share advantage gained by pioneers has typically been treated as a main effect—an automatic regularity. Treating order-of-entry as a main effect implies that there is no penalty on the effectiveness of a brand's marketing instruments for late entry and that a late entrant can compensate for being late by dedicating sufficient marketing resources to their product.

In this study, we investigate the influence of order-of-entry into a market on the effectiveness of a firm's marketing mix decisions by asking the question, "Can followers compensate for not being first by their marketing mix decisions?" Also, even if they can compensate for being late, does this effort become increasingly more difficult with later entry? That is, are there asymmetries in the effectiveness of a brand's marketing mix variables that relate to its order of entry into the market, or as has been typically assumed to date, is order of entry strictly a main effect? An asymmetry exists, for example, if the market response to advertising is different for the first entrant versus the second or third entrant. An asymmetry also exists if the effects of, say, a price change by the first entrant on the second entrant are different than the effects on the third entrant. We develop a market share attraction model where the parameters vary as a function of order-of-entry. Our main contribution is in modeling the sources of order-of-entry advantage as asymmetrics in the effectiveness of a brand's marketing instruments. Hence, distinct from previous research we explain why there are inherent order-of-entry effects. This paper is potentially of interest to researchers developing market share models and studying the effectiveness of marketing-mix variables. The substantive implication of our results concern directly academics interested in marketing strategy as well as the practicing marketing strategists.

We model asymmetries in the market response of early entrants versus late entrants using data from two durables and three nondurables categories. With one exception, all data sets are established from the inception of the category and hence do not suffer from the possible bias of excluding pioneers who have failed. Results show that asymmetries in the effectiveness of a brand's marketing mix variables are an essential source of order-of-entry effects; we find that the main effects of order of entry are minimal. Order-of-entry effects do not necessarily lead to lower shares, but overcoming these effects is not without substantial cost to the late entrant.

Our results support previous research that has demonstrated advantages to early entry. In addition, we provide guidelines for how late entrants should compete. Later entry tends to reduce a competitor's price sensitivity, suggesting that they not instigate in a price war with earlier entrants in order to gain share. Order-of-entry tends to decrease response to quality and to promotion. To achieve the same impact on market share, later entrants need a bigger change in quality and need to spend more on promotion. Our data did not support an asymmetric effect on advertising.
(*Marketing Mix; Competitive Strategy*)

MARKETING SCIENCE/Vol. 15, No. 3, 1996
pp. 222–242

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Order of Entry as a Moderator of the Effect of the Marketing Mix on Market Share

Considerable theoretical and empirical research has been directed towards the competitive advantage gained by the pioneer into a market (Weitz 1985). While it is expensive (Urban and Hauser 1980) and risky (Lieberman and Montgomery 1988) to be a pioneering brand, it is argued that the rewards translate to higher market shares and larger profits. A number of recent studies provide empirical evidence for a pioneering (Biggadike 1979; Robinson and Fornell 1985; Robinson 1988; Moore, Boulding, and Goodstein 1991) or order-of-entry (Urban et al. 1986; Kalyanaram and Urban 1992) advantage. Empirical evidence suggests that, in general, early followers can expect to achieve at most a market share that is no greater than 60% of that achieved by the pioneer, while late followers can be expected to achieve at most a market share equal to 40% of that achieved by the pioneer (Bond and Lean 1977; Whitten 1979; Urban et al. 1986).

To date, the market share advantage achieved by pioneers has typically been treated as a main effect. For example, after controlling for differences in positioning and advertising, Urban et al. (1986) find a significant order of entry effect on the market shares of brands that have been in an industry for at least three years. Treating order of entry as a main effect implies that a late entrant can still compensate for being late by dedicating sufficient marketing resources to their product. However, in these models there is no penalty on the effectiveness of the marketing instruments and with sufficient resources, the late entrant can achieve a market share superior to the pioneer. Such cases where the first entrant loses its leadership position do indeed occur. For example, Viceroy lost its position to Winston and Marlboro in the plain filter cigarette market (Whitten 1979), EMI, a British firm was first in the CT scanner market, though General Electric now dominates the market, and Glaxo's Zantac surpassed Smith-Klein's Tagamet, the first entrant into the ulcer therapy market. However, it is not clear what these firms had to do to circumvent their early handicap. Bond and Lean (1977) in the pharmaceutical market and Whitten (1979) in the cigarette market found that late entrants with differentiated products supported by heavy promotions can overcome the handicaps of being late. AT&T for example, was able to capture a substantial share of the credit card market by entering with heavy advertising and low price. Introduced in March 1990, AT&T obtained 10.5 million customers within a year following introduction, taking fourth rank among the most popular bank cards (ABA Banking Journal 1991; Wall Street Journal 1991). This raises two fundamental questions. First, can followers compensate for not being first by their marketing mix decisions? Second, even if they can compensate for being late, does this effort become increasingly more difficult with later entry? That is, are there asymmetries in the effectiveness of a brand's marketing mix variables that relate to its order of entry into the market, or as has been typically assumed to date, is order of entry strictly a main effect?

In this paper, we examine asymmetries in the effectiveness of a brand's marketing mix efforts. Research on market response modeling (e.g., Carpenter et al. 1988; Blattberg and Wisniewski 1989) indicates that asymmetries between brands exist and can be an important competitive phenomenon. Here, we intend to explain these differences across brands by the brand's order of entry. An asymmetry exists, for example, if the market response to advertising is different for the first entrant versus the second or third entrant. The modeling of asymmetries is particularly important for the timing and the marketing plan of an entry if the asymmetries are systematically related to order of entry (Kalyanaram and Urban 1992).

The paper proceeds as follows. In the next section, we examine the relationship between order of entry and performance. We then elaborate on the moderating role of order of entry on the effectiveness of a firm's marketing mix efforts, introduction strategies, and market share. We develop a model to test our hypotheses. The model is based on a market share attraction model (multiplicative competitive interaction) used previously in the literature to model sources of asymmetries and explore their strategic implications (Carpenter et al. 1988; Cooper and Nakanishi 1988). Following the model development, we present our data and then discuss the results of our empirical analysis. We conclude with a discussion of the implications of our findings and suggest some directions for future research.

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Empirical Evidence of Order of Entry Effects

In general, the literature suggests that the advantages of early entry dominate the disadvantages. By entering the market first, the pioneer can choose to position itself in the most profitable segment and can initially realize monopolistic profits. On the other hand, late entrants face less uncertainty of market demand and less consumer resistance towards adopting a new innovation (Gatignon and Bansal 1990). Lilien and Yoon (1990), in a study of 112 new industrial products from 52 French firms, found that the likelihood of success for the third and fourth entrants into a market was higher than for the fifth and sixth entrants as expected, but was also higher than that of the first and second entrants. Success was defined as whether or not a new product grew into a product group for the introducing firm. The first entrant, therefore, must trade off the possibility of high return if successful, against the risks of premature entry. Golder and Tellis (1993) question the conclusions from empirical studies that exclude nonsurvivors. In 17 (47%) of 36 product categories examined, they found that the brand with the first instance of sales no longer had sales in the category. It is not clear however, if, or how, these failure rates differ from nonpioneers in the categories examined.

Main Effect of Order of Entry

To date, pioneering advantage has typically been modeled as a main effect (e.g., Biggadike 1979; Urban et al. 1986). That is, after controlling for differences in, say, quality and advertising, market share has been found to vary systematically with a brand's order of entry into the market. For example,

$$MS = \text{Order}^{\beta_1}\text{Quality}^{\beta_2}\text{Advertising}^{\beta_3} \cdots . \quad (1)$$

While, as discussed below, a number of competing explanations for an order of entry effect have been proposed, the main effect model suggests an automatic regularity without explanation.

Recursive Effect of Order of Entry

A number of studies using data from the PIMS database has suggested that the market share advantage for pioneering firms is due in part to order of entry effects on factors such as product quality, cost of advertising, and the cost of production (Robinson and Fornell 1985; Robinson 1988). That is, a recursive influence has been proposed whereby pioneering influences, for example, relative product quality and the relative prices that brands charge.

$$MS = \beta_0 + \beta_1\text{Quality} + \beta_2\text{Price} + \cdots \quad (2)$$

where:

$$\text{Quality} = \alpha_0 + \alpha_1\text{Pioneer} + \cdots$$

$$\text{Price} = \delta_0 + \delta_1\text{Pioneer} + \cdots .$$

Empirically, Robinson and Fornell (1985) find that order of entry affects the difference in market shares between pioneers and followers through its influence on price, relative quality, and relative product line breadth. Pioneers have better product quality, broader product lines, and lower relative prices. However, the recursive effect approach provides only a partial explanation for the existence of a pioneering advantage—it does not, for example, indicate why the quality of the pioneer is higher and why its price is lower. Also, if such regular tendencies in market offerings exist, it is not clear why followers fail to act on these differences. Indeed, late entrants should offer better quality, a broader product line, and/or lower price unless it costs more for late entrants to do so.

Order of Entry and the Diffusion Process

Later entrants' products may diffuse faster than the pioneer's product since consumers have little initial product knowledge (Sujan 1985), and early entrants must incur the cost of educating consumers. When a product first appears on the market, some consumers may be uncertain about how to evaluate the product. By entering at a later date when consumer uncertainty about category benefits is lower and consumer confidence in the evaluation process is higher (Gatignon and Robertson 1985), a later entrant's product may diffuse faster.

The studies discussed above that model order of entry as a main effect or model pioneering as a recursive system, have been estimated using cross-sectional data. Recently, Kalyanaram and Urban (1992) examined order of entry effects using time series and cross sectional data for frequently purchased consumer products. They extend Urban et al. (1986) to control for the effects of more/different marketing mix variables and to examine

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the influence of order of entry on a firm's market share growth rate. They examine market share and marketing mix variables relative to the first entrant, an approach that allows the use of cross category data and does not require data on many competitors in a market, but one that implies a constant ratio model (a new entrant draws share from existing competitors in proportion to their existing shares). Their results indicate that all else being equal, later entrants approach their eventual share levels faster (i.e., diffuse faster) than earlier entrants, and they confirm that the asymptotic values for later entrants are lower.

This study represents an important step towards understanding the dynamic effects of order of entry. However, their model does not guarantee that the market share of the follower is always lower than that of earlier entrants—it may depend solely on the lag between entry. The lag between entries could be the sole reason for the follower having a different market share than the earlier entrant. Nevertheless, this model demonstrates the importance of controlling for diffusion. This control can be done either by explicitly modeling the diffusion (e.g., Brown and Lattin 1994) or by selecting a sample where diffusion effects are minimal. In fact, Kalyanaram and Urban (1992) found a quick diffusion for their sample with the first brand achieving its potential within a two-month period and the followers within one month. Therefore, diffusion benefits or handicaps might be relatively small for frequently purchased consumer products. They could be more critical for durable goods.

The question of whether order of entry is a long run effect has been raised (Fershtman, Mahajan, and Muller 1990). While such an effect has been shown for brands that have been in the market for at least three years (Urban et al. 1986), the effect may depend on the time the brands have been in the market. For example, the effect may be different when the brands have been in the market, say, five years on average, versus 15 or 20 years on average. Brown and Lattin (1994) argue that the pioneering advantage consists of two components: (a) an order of entry effect or permanent (constant over time) share advantage which is greatest for the first entrant and smaller for each subsequent entrant, and (b) a component which is related to a brand's time in the market and whose effect dissipates over time as consumers learn about and adjust to the presence of all brands in the market. Fershtman, Mahajan, and Muller (1990) model a duopoly and identify conditions where order of entry has no main effect on long term market shares. In particular, if the pioneer initially enjoys advantages of a higher level of goodwill, lower price, brand loyalty, lower production costs, and lower advertising costs which dissipate over time, then the final steady state market shares do not depend on the magnitude of these advantages or on the length of time it took to overcome them. That is, order of entry alone does not influence long run market shares, but instead it is the effect of order of entry on price elasticity, production costs, and advertising costs.

Our interest is in investigating the influence of order of entry on the effectiveness of a brand's marketing decision variables as an explanation for differences in the market performance of the brands.

Order of Entry Effects and Marketing Mix Effectiveness

A number of theoretical arguments have been advanced to explain why order of entry effects exist. Early (main effects) explanations centered around the risk of trying new brands (Schmalensee 1982), the stability of consumer preferences (Bain 1956), barriers such as brand names and patents (Porter 1980), and product positioning (Hauser and Shugan 1983). More recently, as indicated earlier, a recursive process has been advanced whereby pioneering firms are shown to have achieved their position through cost advantages, quality advantages, and consumer information or customer switching factors (Robinson and Fornell 1985; Robinson 1988). These explanations, however, have suffered from problems in definition (Montgomery 1988), from weak empirical support (Lieberman and Montgomery 1988), and have been challenged as to whether or not they are sustainable in the long term (Fershtman, Mahajan, and Muller 1990). More promising directions focus on consumers and the issues of preference formation and consumer learning mechanisms (Carpenter and Nakamoto 1987, 1989; Kardes and Kalyanaram 1992), and on consumer decision processes (Kardes et al. 1993). The key theoretical mechanisms leading to order of entry effects are described briefly. Then, these are developed in the context of each marketing mix variable.

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Theoretical Mechanisms for Order of Entry Effects

Two behavioral mechanisms are relevant to explain order-of-entry effects: learning mechanisms in memory and categorization.

Memory and Learning Mechanisms. Learning about a new product category is often difficult for consumers. If the category is particularly novel, consumers likely have little initial knowledge (Alba and Hutchinson 1987; Sujan 1985). However, exposure to brands presents consumers with an opportunity to learn, and consumer preferences are expected to evolve over time as they are updated through the learning mechanism (Kahneman and Snell 1988). Since brands enter the market in a sequential manner, earlier entrants have a greater opportunity to contribute to the initial learning mechanism. Hence, a pioneer does not react to established preferences. Instead, it develops the best position by shifting the taste distribution towards its position and by influencing the attribute weights buyers use to evaluate brands (Carpenter and Nakamoto 1989). The learning process is influenced by both the attribute composition of various brands and the order in which the brands are presented. Therefore, we would expect a different preference structure to have evolved if the entry orders of the various brands were altered.

In most decisions, memory factors play a crucial role. While research on decision making and choice has typically focused on the limited capacity of short term memory, Alba, Hutchinson, and Lynch (1990) argue that the effects of long term memory are so pervasive and fundamental as to cast doubt on any purely stimulus-based decision making. Memory affects not only the amount of information that enters into a decision process, but also the type of information considered and the heuristics used to process it. Brands that are preferred or prototypical of the product class tend to be recalled more frequently and more quickly; such brands enjoy a memory based advantage relative to their competitors (Alba and Hutchinson 1987). This suggests that later entrants are at a disadvantage. They have to "work harder" to have their messages heard and acted upon by consumers. Pioneers tend to be more familiar. Familiar brands are more likely to be perceptually enhanced, which gives them a competitive advantage in the "race" for consumer attention as consideration sets are being formed (Alba and Hutchinson 1987), and a brand cannot be selected if it is not considered.

Information search and information integration also influence the magnitude of the pioneering advantage (Kardes and Kalyanaram 1992). Sequential exposure to information about different brands produces differential learning about brands as a function of their order of entry. In particular, because brands in a category have many overlapping features, these features, while novel and attention-drawing for the earlier entrants, are redundant and uninteresting for later entrants. Hence, learning about brands decreases with order of entry, and the pioneer benefits from more extreme and confidently held judgements.

Categorization. Categorization involves comparison between a target and category knowledge. Individuals tend to organize their belief systems about products around category-related factors rather than a set of single brand attitudes or beliefs (Cohen and Basu 1987). In addition to its role in preference formation, the pioneer is much more likely to become prototypical of the product category (Carpenter and Nakamoto 1987). The prototype for a category is that one instance which shares the most features with its category and the fewest features with other categories (Medin and Smith 1984). Two factors favor the prototypical brand. First, when a new instance becomes available, an individual compares it with the prototype to see if it belongs to the category. Secondly, prototypicality implies that the pioneer is that brand most closely associated with the product category. Hence, later entrants positioned "close" to the pioneer may make the pioneer more prominent. This suggests that "me-too" strategies by later entrants are likely to be ineffective (Carpenter and Nakamoto 1989).

Sujan and Bettman (1989) discuss the impact of new information on the general product category schema when a new brand enters with a differentiation strategy. The emphasis is on how consumers cope with information incongruent to their present mental schema. Drawing on O'Sullivan and Durso (1984), they discuss the schema and tag model—an appropriate model when the features of the new brand entering the market are moderately discrepant to the generic schema. They

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predict that the new brand will be seen as having many features common to the generic schema, but will also contain a unique tag linking the differentiating attributes to the brand. Also, they predict that for a differentiated brand, memory will decline faster over time for the discrepant (tagged) brand attributes than for consistent brand attributes because the former are not as strongly associated with the organizing schema. Hence, if the pioneer is more closely associated with the category schema, then later entrants are at a disadvantage. For a differentiated late entrant, memory for its unique or differentiating features will decline faster over time than those associated with pioneer (category schema).

Our interest is in investigating the influence of order of entry on the effectiveness of a brand's marketing decision variables. Concepts from the memory and categorization literatures introduced above provide a theoretical base to understand this phenomenon. In particular, we now describe how order of entry influences price effectiveness, market response to quality, advertising effectiveness, and distribution effectiveness through its effect on the priming of brands, evoked set composition, and cognitive processing effort.

Order of Entry and Price

Bond and Lean (1977) and Carpenter and Nakamoto (1989) find that later entrants often fail to gain market share even with substantial price cuts. A brand that contributes greatly to the process by which a consumer becomes aware of and learns about a product category, is likely to be viewed as prototypical. Carpenter and Nakamoto (1989) argue that later entrants positioned close to the prototypical brand become less distinct, while the prototype becomes more distinct. Since consumers often organize their product knowledge based on the prototype, that brand has the advantage of being perceptually distinct. That is, the prototype (perceptually) overshadows later entrants. Because the later entrant is less distinct, then, all else equal, any price reduction by the later entrant has less impact than a price reduction by the (more distinct) prototype. Carpenter and Nakamoto provide experimental results to support this argument. Hence, there should be asymmetries with respect to the market's response to price. Later entrants are at a disadvantage when competing on price since market response to a price change by a later entrant is lower than that for earlier entrants. This argument is consistent with the empirical results of Ghosh, Neslin, and Shoemaker (1983). They found that new ready-to-eat breakfast cereals tended to have lower (less negative) price elasticities. This means that late entrants need to decrease their price to a greater extent than earlier entrants to achieve the same effect on market share. A similar finding would be expected if later entrants were successful in achieving a subtyped position where they appeal to less price sensitive consumer segments.[1]

Therefore, in general, brand i's price sensitivity, $\beta_p(i)$, will be moderated by its order of entry, O_i, into the market,

$$\beta_p(i) = f_p(O_i) \quad (3)$$

and we suggest Hypothesis 1 that a brand's price sensitivity is a decreasing function of its order of entry, i.e., $|\partial f_p/\partial O| < 0$, where the function f_p represents the relationship in Equation (3).

Order of Entry and Product Quality

A consideration set is those brands that the consumer seriously considers when making a purchase decision. Hauser and Wernerfelt's (1990) evaluation cost model of consideration sets suggests that later entrants must provide a higher quality product.[2] A number of empirical studies have shown that the size of the consideration set tends to be small relative to the total number of available brands (Hauser and Wernerfelt 1990). They argue that the consideration set of a rational consumer will represent tradeoffs between decision costs and the incremental benefit of choosing from a larger set of brands. The decision to evaluate a brand for inclusion in a consideration set is modeled as different from the decision to consider an evaluated alternative. The decision to evaluate a brand entails a trade-off between the cost of search and the expected benefit from including the brand in the consideration set. The decision to

[1] A subtyped position is one where perceptions about the competitor are strongly discrepant from the general category (Day, Shocker, and Srivastava 1979; Sujan and Bettman 1989).

[2] Product quality typically refers to the characteristics or attributes of the product which correspond to consumers' needs (e.g., Lambin 1970a, b). Therefore, product quality is typically measured in terms of attributes or benefits (Lambin 1970a, b; Lambin, Naert, and Bultez 1975; Gatignon, Weitz, and Bansal 1990).

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include a brand in the consideration set entails a tradeoff between the expected benefits at consumption and the incremental decision costs of choosing from a larger set of brands. The Hauser and Wernerfelt (1990) model predicts an order of entry penalty to late entrants. When a new brand is evaluated or enters the consideration set, its perceived incremental utility must exceed the (discounted) evaluative search and/or decision cost. In particular, later entrants must provide increasingly larger additional incremental benefits to ensure their inclusion in the consideration set. The market is more demanding of later entrants, and later entrants must provide higher levels of product quality.

The information integration model proposed by Kardes and Kalyanaram (1992) argues that consumers fail to integrate information about later entrants into their knowledge base. Later entrants must provide larger incremental benefits in order to be fully evaluated by consumers.

In general, the market response to brand i's product quality, $\beta_q(i)$, will be moderated by its order of entry, O_i, into the market:

$$\beta_q(i) = f_q(O_i). \tag{4}$$

We propose Hypothesis 2, that the market response to quality improvement efforts decreases with order of entry, i.e., $\partial f_q / \partial O < 0$.

Order of Entry and Advertising Effectiveness

A number of previous studies have proposed factors which may moderate advertising effectiveness. These include the type of advertising (e.g., national versus local) (Popkowski Leszczyc and Rao 1990), the nature of the product (e.g., low versus high involvement) (Krishnamurthi and Raj 1985), and the degree of competitive reactivity (Gatignon 1984). More importantly, from a strategic point of view, we propose that order of entry has a moderating effect on a brand's advertising effectiveness. The objectives of advertising include positioning and creating awareness. From the consumer's perspective, advertising influences perceptions and facilitates recall. This, in turn, has implications for which brands are evoked and how brands are evaluated. The categorization and memory literatures, therefore, provide a useful framework for studying how order of entry influences advertising effectiveness.

Through its role in category preference formation, the pioneer is likely to become prototypical of brands in the category (Carpenter and Nakamoto 1987, 1989) and hence the benchmark upon which new brands entering the market are evaluated for inclusion as a member of the product category. This would suggest that the pioneer would benefit most from any product class or product type cues (e.g., category level advertising) and later entrants would benefit only from brand specific cues (Sujan and Dekleva 1987). Similarly, Cohen and Basu (1987) argue that marketing efforts to create and communicate specialized product characteristics create not only a particular identification of a product, but also the increased salience of information relevant to the product category together with category based inferences that result. This suggests that later entrants may be at a disadvantage. Pioneers may indirectly benefit from later entrants' advertising, while later entrants experience little indirect benefit from the earlier pioneer's advertising.

Memory theories on choice also provide a rationale for an order of entry effect on advertising effectiveness. Recent research suggests that recalling one brand in a product category can facilitate or dampen the recall of other brands and that the effect is contingent upon how the brands are grouped in memory (Alba and Hutchinson 1987). For example, more prominent or accessible brands in memory can be evoked both through direct priming and indirectly through the priming of another brand in the subcategory (Nedungadi 1990). The probability of retrieving a particular brand is a multiplicative function of brand and subcategory activation. Direct priming refers to providing an external cue intended to increase the probability that the brand is retrieved. Priming a brand, by increasing subcategory activation, may also increase the probability of retrieving other brands in the subcategory. This influence on the other brands in the subcategory is referred to as indirect priming (Nedungadi 1990). Such a retrieval is most likely for the more prominent brands in the subcategory. Minor brands in a category benefit primarily from direct priming of that particular brand.

Nedungadi (1990) studies memory-based choice situations where changes in a brand's accessibility may affect the probability that it is retrieved and considered for choice. For a brand to be selected in memory-based

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choice, the consumer must recall that brand and fail to recall other brands that might otherwise be preferred. Much of advertising serves to prime a particular brand. If some brands are more prominent or accessible in memory, due either to their positioning, familiarity or prototypicality, then the consumer is biased in favor of including those brands in their consideration set; the early entrant benefits from both direct brand priming and indirect brand priming. This implies asymmetric effects of advertising. Later entrants are at a disadvantage due to their advertising being less effective.

The influence of order of entry on advertising effectiveness is not limited to categorization and memory-based effects. Later entrants compete in increasingly crowded markets and thus their message must be heard over increasing amounts of "noise." Also, pioneering brands are not passive, but instead typically continue to advertise and improve their product and positioning. Finally, indications are that primary demand advertising elasticity declines over the product life cycle (Parsons 1975). This would be consistent with decreasing brand elasticities as new brands enter the market.

These arguments suggest that the effectiveness of brand i's advertising expenditures on its market share, $\beta_a(i)$, will be moderated by its order of entry, O_i, into the market:

$$\beta_a(i) = f_a(O_i). \tag{5}$$

In particular, we propose Hypothesis 3, that advertising effectiveness is a decreasing function of order of entry into the market, i.e., $\partial f_a / \partial O < 0$.[3]

Order of Entry and Distribution

Robinson and Fornell (1985) argue that pioneers may have access to more efficient distribution channels or be able to prevent competitors from using the distribution channel entirely. In particular, they suggest that in convenience goods industries characterized by low prices and high purchase frequency, pioneers may be able to dominate available retail space. This is supported by Alpert et al. (1992) who find that reseller (retailers and wholesalers) buyer attitudes become less favorable with later entry, particularly when the brand is the second or later me-too follower brand.

Two influences of distribution are important. First, if pioneers are able to lock out later entrants from a distribution channel entirely, then late entrants could achieve lower market share solely due to their limited distribution; they have access to fewer buyers. Secondly, pioneers, by virtue of their earlier entry, could capture or dominate the most effective channels of distribution. Hence, the effectiveness of a later entrant's distribution efforts may be lower than that of pioneering brands. In this study, products are sold through (often) well established distribution channels. For the durable categories examined, the channel is a captive one. Hence, it is necessary to control for the first influence—differences in available retail outlets. In this case, the order of entry effect on distribution is a recursive effect in the sense that order of entry is a determinant of the level of distribution coverage which, in turn, affects market share.

Data

Data used in previous studies on order of entry effects has been criticized for including only surviving brands (Lieberman and Montgomery 1988; Kerin et al. 1992; Golder and Tellis 1993), for considering only cross sectional effects (Fershtman, Mahajan, and Muller 1990; Kerin et al. 1992), and for (with few exceptions) studying only a single product category (Kerin et al. 1992). Appropriate datasets should contain both new entrants and brands withdrawing from the market, and they should have both cross sectional and time series observations. In fact, time series of cross sections are required to test alternative or complementary explanations for changes in elasticity over time and across brands: brand elasticities could not be estimated without time series data; multiple brands are necessary to investigate order-of-entry effects as the number of competitors in a market changes and multiple markets are desirable for generalizability purposes. In addition, since our interest is

[3] In contrast with this rationale for decreasing advertising elasticities as order of entry increases, the diffusion literature suggests that pioneers often bear the expense of category development (Rogers 1983). In addition, it is suggested that advertising is most effective under less cognitive processing (Gatignon and Robertson 1985). Cognitive processing tends to be higher for pioneers by virtue of their entering when category uncertainty is high, and for late entrants by virtue of the vast amounts of information consumers must process when faced with a large number of differentiated products from which to choose.

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in testing hypotheses about the influence of order of entry on the effectiveness of a brand's marketing mix variables, the markets under study should be ones where a brand's marketing decision variables play an important role. Five product categories satisfying these criteria are examined—two categories of durable products and three categories of consumer nondurable products. The two durables categories are the sport utility vehicle market and the minivan market from 1983–92. We also analyze data from three nondurable categories that have helped establish the relationship between order of entry and market share. These data were used previously by Kalyanaram and Urban (1992).

Durables (Automotive) Data

While the product category sport utility vehicles was established over 20 years ago, considerable competitive activity took place during the 1980s. When our observation period began in 1983, nine brands competed in the market (three of which were line extensions). During the 10-year period 1983–92, 17 new brands entered, including the current market share leader, the Ford Explorer in 1990, and five withdrew. As the market got increasingly crowded, and as the vehicles began to appeal to a wider range of consumers, competitive rivalry increased (*Wall Street Journal* 1990). For example, more rivals entered, some pricing much below existing competition, some brands became available in 4-door versions, and many additional luxury options were offered. These changes in competitive offering and the consequences on market share are captured by an attraction model specification.[4]

The minivan category was established in 1983 with the introduction in September of the Toyota Van followed two months later by the Chrysler Caravan and Plymouth Voyager brands. During the period 1983–92, 16 brands entered and three brands exited, including the pioneer, which was replaced by the Toyota Previa.

Market Share and Order of Entry Data. *Ward's Automotive* collects monthly unit sales data for all brands of automobiles and trucks sold within the United States. The market share for each brand in any particular month was calculated as the sales for the brand during the month divided by the total sales of all the brands in the category during the month.

A brand's entry period into the market was defined as the first period of sales. A brand's exit period (if applicable) from the market was defined as the brand's final period of sales. Our observation period includes the inception of the minivan product category. To determine the order of entry for brands in the sport utility vehicle category that entered prior to January 1983, we examined both monthly sales data (when available) for years prior to 1983 and brand descriptions found in *Automotive News*, and in the appropriate issue of *Ward's Automotive Yearbook*. When sales data were available, they were used to determine a brand's entry period into the market and hence its order of entry. However, for issues prior to 1980, *Ward's* did not provide detailed monthly sales data. For these years, a brand's entry period was determined from the *Yearbook's* description of any new product introductions with each manufacturer. Following Urban et al. (1986), order is determined using only those brands that survived to the start of our observation period. Table 1 presents the order of entry, average unit sales per month, and average market share for each brand.

Price Data. For each model year, *Ward's Automotive* publishes the suggested base price of each vehicle. The wide variety of optional equipment and proliferation of manufacturer and dealer pricing incentives, however, means that customers seldom pay this price. Since equipment that is optional on one brand may be standard on another, prices may not be for comparably equipped vehicles. Also, any pricing incentives are not likely offered uniformly across brands or customers. However, in practice, it is impossible to control for the variety of optional equipment ordered across customers. Therefore, the base price is used as in the majority of aggregate econometric models (e.g., Lambin 1970a, b; 1972a, b; Lambin and Dor 1989; Wildt 1974).

The price of a brand for a particular model year was taken as the base price, or when a number of base model configurations were available, the midpoint of the range of base price offerings. Table 1 presents the price data for each brand.

[4] As discussed below, the attraction model also represents the fact that the marketing mix elasticities of a brand decrease as the market share approaches saturation.

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Table 1 Sport Utility Vehicle and Passenger Minivan Data 1983–92

Brand	Order of Entry	Entry Period[1]	Exit Period[1]	Avg. Sales (units/mo.)	Avg. Market Share	Median List Price ($)	Avg. Quality Rating	Average Advert'g ($k/mo.)	Avg. Dist'n (No. of Dealers)
Bronco	1	–	–	3,824	6.9%	16,039	3.03	496	4,644
Blazer	2	–	–	2,444	4.6%	15,192	2.22	347	4,908
Jimmy	3	–	12/91[2]	596	1.1%	14,621	2.25	128	2,429
CJ	4	–	12/86	2,755	6.7%	7,235	1.89	71	1,458
Ramcharger	5	–	–	1,532	2.9%	14,202	2.83	17	2,965
Cherokee	6	–	–	9,008	14.2%	14,324	2.39	1,909	1,511
Blazer-S[3]	7	–	–	13,828	22.5%	12,126	2.60	350	4,908
Jimmy-S[3]	8	–	–	3,112	5.3%	12,175	2.55	78	2,419
Bronco-II[3]	9	–	8/90[2]	9,020	15.8%	12,665	2.72	0	4,705
Montero	10	3/83	–	467	0.1%	13,691	3.28	341	260
Wagoneer	11	9/83[4]	12/90	948	1.7%	18,521	2.32	231	1,459
Trooper	12	2/84	–	2,755	4.3%	14,078	3.01	1,042	478
4-Runner	13	5/84	–	1,450	2.2%	14,820	3.19	312	1,122
Samurai	14	1/86	–	2,389	3.6%	7.634	3.45	617	246
Wrangler	15	4/86	–	3,537	5.2%	11,751	2.16	658	1,532
Raider	16	8/86	6/90	909	1.3%	12,117	3.50	11	3,025
Pathfinder	17	12/86	–	2,626	3.8%	17,659	3.05	999	1,108
Sidekick	18	9/88	–	1,128	1.6%	11,331	2.93	674	301
Tracker	18	9/88	–	2,141	3.1%	11,364	3.00	107	4,143
Amigo	20	2/89	–	690	1.0%	12,284	–	800	586
Rocky	21	11/89	–	256	0.0%	12,510	–	154	223
Rodeo	22	7/90	–	2,518	3.4%	15,162	3.00	924	593
Explorer	23	9/90[2]	–	22,566	31.5%	19,458	3.00	1,993	4,444
Navajo	23	9/90	–	822	1.2%	18,024	3.00	731	895
Bravada	25	11/90	–	970	1.3%	24,915	–	454	3,063
Yukon	26	1/92[2]	–	504	0.1%	–	2.25	565	2,334
Toyota Van	1	9/83	12/89[2]	1,569	9.6%	12,775	3.59	165	1,096
Caravan	2	11/83	–	13,978	28.8%	13,364	2.90	1,924	2,977
Voyager	2	11/83	–	12,429	26.1%	13,445	2.94	2,016	2,995
Astro	4	11/84	–	6,548	12.3%	13,613	2.48	602	4,854
Safari	4	11/84	–	1,721	3.1%	13,678	2.50	179	2,408
Aerostar	6	7/85	–	12,029	20.9%	13,938	2.78	1,041	4,590
Mitsubishi	7	11/86	3/92	262	0.5%	14,961	3.07	70	333
Nissan Van	8	1/87	9/91	604	1.2%	15,931	2.04	84	1,110
Mazda MPV	9	8/88	–	3,142	4.7%	16,369	3.27	0	872
Town & Country	10	6/89	–	624	0.9%	25,304	2.93	1,237	2,988
Lumina	11	7/89	–	3,976	5.7%	16,085	2.11	753	4,696
Trans Sport	12	10/89	–	2,222	3.2%	17,961	2.75	882	2,939
Silhoutte	12	10/89	–	1,583	2.3%	18,641	2.29	604	3,083
Previa	14	1/90[2]	–	3,704	5.3%	19,397	3.00	1,917	1,186
Villager	15	7/92	–	2,453	3.3%	19,151	–	4,405	2,649
Quest	15	7/92	–	1,416	1.9%	19,298	–	2,081	1,098

[1] Brand introductions and exits that take place during our observation period are shown as month/year.

[2] Yukon replaced Jimmy, Explorer replaced Bronco-II, and Previa replaced the Toyota Van. The mix of sales within the transition year was not available. We attributed all sales to the new brand beginning in the quarter that sales of the new brand were discussed by the popular press.

[3] Blazer-S, Jimmy-S, and Bronco-II are line extensions. Advertising for the related, earlier entrant (not shown in this table) averaged $347 k/mo. for the Blazer, $140 k/mo. for the Jimmy-S, and $646/mo. for the Bronco-II.

[4] Wagoneer is a brand extension—the Wagoneer brand name was also used for a truck introduced at an earlier date. The substantive conclusions from our analyses do not change if we establish order of entry based on the first usage of the brand name within any automotive category.

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Product Quality Data. Objective product quality refers to the actual technical superiority of a product (Hjorth-Anderson 1984; Monroe and Krishnan 1985). It is that which is measurable and verifiable (Curry and Faulds 1986). On the other hand, perceived quality is the consumer's judgement about the superiority or excellence of the product (Zeithaml 1988). Perceived quality tends to be an overall judgement (Olshavsky 1985; Zeithaml 1988) that is influenced not only by a firm's efforts to improve its objective quality, but also other factors such as price (e.g., Curry and Faulds 1986; Gerstner 1985) and advertising. Lichtenstein and Burton (1989) (using *Consumer Reports* data as a measure of objective product quality) find a positive correlation between perceived and objective price quality relationships. For this study, we examine product quality based on data reported in *Consumer Reports*. *Consumer Reports* data have been used previously in research as a measure of product quality (e.g., Curry and Faulds 1986; Lichtenstein and Burton 1989). *Consumer Reports* publishes quality ratings of motor vehicles on 17 items. Each item is rated on a 5-point scale. The ratings represent frequency of repair estimates based on a survey of their readers. These measures reflect product quality information available to consumers. We use the most recently published ratings on the newest model. Hence, we assume that product quality perceptions are influenced by published ratings of the prior year's model.

A factor analysis was done for sport utility vehicles and for minivans. The two factors with the largest eigenvalues were similar in both markets: a measure of body/engine quality and a measure of transmission quality. In the subsequent analyses, we examined including multiple measures of product quality. However, in all cases, only the measure of body/engine quality was significant. For parsimony, we present results that include only this single dimension for product quality. Quality is measured by the items body exterior (paint), body hardware, body integrity, electrical system, and engine mechanical. An exploratory factor analysis revealed a single factor structure.

Advertising Data. *Leading National Advertisers* (LNA) collects advertising data covering a number of print media including magazines and newspapers. All major and most minor newspapers and magazines are scanned for advertisements. Based on the size of the advertisement and its format (color or black-and-white), LNA uses advertising rate cards supplied by publishers to estimate expenditures for each brand.

Broadcast Advertising Reports (BAR) collects advertising data for a number of broadcast media including local spot television, national network television, cable television, and radio. Based on the time of day an advertisement is aired, its duration, the broadcast station, and the audience covered (local or national), BAR estimates brand specific broadcast advertising expenditures.

The total advertising expenditure for each brand is the total of the broadcast media and print media expenditures. Since quarterly data is available, a uniform monthly distribution within each quarter is used. Table 1 presents the average monthly advertising expenditures for each brand.

There are three line extensions in the sport utility vehicle category—Bronco II (Bronco), Blazer-S (Blazer), and Jimmy-S (Jimmy). For these brands, in addition to advertising for the brand under study, we also included a measure to capture the influence of advertising expenditures for the related entrant.

Distribution Data. *Automotive News* publishes the number of retail truck outlets by manufacturer as of January 1 of each year. Retail outlets include dealerships, distributorships, and factory-owned outlets. For this study, the simple two-point average was used as an estimate of the number of retail outlets for each manufacturer throughout a calendar year. We assumed that when a manufacturer such as Jeep produced multiple brands, all the brands were available at all Jeep outlets. Table 1 presents the average monthly number of new truck dealer outlets for each brand. With few exceptions, the number of outlets remained relatively stable over the ten year observation period.[5]

[5] The sport utility vehicle brands were produced by 18 different manufacturers. For 11 of the manufacturers, the maximum number of distributors was no greater than 10% above the minimum, for 2 manufacturers, this value was between 10% and 20%, and for 1 this value was between 20% and 30%. Daihatsu, Isuzu, Mitsubishi, and Suzuki were the only manufacturers to ever have fewer than 750 outlets during our observation period, and were the only instances where the maximum number of distributors exceeded the minimum by greater than 50% over the 10-year period.

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Nondurables Data

Kalyanaram and Urban (1992) examined penalties associated with late entry using data from eight categories of consumer packaged goods, in eight cities, over the period October 1983 to January 1988. They generously provided their data, excluding advertising expenditures, for seven categories. Measures for weekly sales, suggested price, promotional expenditures, and monthly distribution were available. Three categories were useable for testing our model based on the criteria that complete data was available for all major competitors, and that the first entrant in the markets under study entered during the observation period (required to determine a "time in market" measure discussed subsequently). The categories used were: tartar-control toothpaste, over-the-counter ibuprofen pain reliever, and frozen pineapple drink. The ibuprofen data was in two noncontiguous time series. A third competitor entered during the period of no observation, and its entry date into the observed markets was assumed identical to the national roll-out date discussed in *Advertising Age*.

Advertising Data. As described above for the durables categories, total advertising expenditure for each brand was determined using data collected by LNA as the total of the broadcast media and print media expenditures. Again, since quarterly data is available, a uniform distribution within each quarter is used.

Two of the nondurable categories are line extensions. Two measures of advertising were developed: expenditures that include a message about the specific line extension under study, and all other advertising expenditures for the brand name under study within the category. For example, in the tartar control toothpaste category, we measured "brand" advertising as expenditures for the specific line extension under study (i.e., Crest tartar control toothpaste), and "related brand" advertising as any advertising for other Crest toothpaste products (e.g., Crest toothpaste, Crest for kids).

Model Specification

Our interest is in testing whether asymmetries in response to competitors' marketing efforts are systematically related to order of entry into the market. Models such as Kalyanaram and Urban (1992) and Urban et al. (1986) assume that the effectiveness of advertising is identical for all brands in the market. Consequently, in their models, there is no differential advantage of advertising and no barrier created due to advertising or other marketing mix variables. Asymmetries in market response cannot be estimated with only cross-sectional data. Therefore, a model that uses both cross-sectional and time series data and allows for asymmetries in marketing mix response across competitors is required. The multiplicative competitive interaction (MCI) model (Nakanishi and Cooper 1974, 1982) embodies these characteristics. The results of Ghosh, Neslin, and Shoemaker (1983) also suggest that the MCI model is appropriate for studying the influence of order of entry on the effectiveness of a firm's marketing mix variables. They find that price elasticity decreases with increasing market share and hence, a model that is sensitive to this phenomenon is needed.

A multiplicative form for each competitor's sales response function is specified. Let A_i be the attraction of brand i ($i = 1, 2, \ldots, I$) and MS_i be its market share. The attraction of a particular brand is a function of its marketing efforts. The market share of brand i is then simply the ratio of the attraction of brand i to the sum of the attraction of all the competitors in the industry:

$$MS_i = \frac{A_i}{\sum_{j=1}^{I} A_j}, \quad (6)$$

We have identified five marketing mix variables—price (P), promotion (PO) for non-durables,[6] product quality (Q) for durables, advertising expenditures for the brand (A),[7] and, for line extensions, advertising expenditures of related brands carrying the same brand name (AR)—whose effectiveness may be influenced by a brand's order of entry into the market. In addition, we control for differences in distribution (D). When both

[6] The influence of order-of-entry on promotional expenditures was not explicitly discussed above. However, many of the mechanisms that contribute to a moderating role of order of entry on price and advertising sensitivity should also be applicable for sensitivity to promotional expenditures.

[7] Similar to Gurumurthy and Urban (1992), we used instantaneous advertising expenditures. We also estimated our model using three-year cumulative expenditures (motivated by Urban et al. (1986)), and cumulative expenditures with decay over the previous 36 months, and did not find any improvement in model fit.

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cross-sectional and time series data are available, the market share for brand i is given by

$$MS_{it} = \frac{e^{\beta_0(i)} P_{it}^{\beta_1(i)} PO_{it}^{\beta_2(i)} Q_{it}^{\beta_3(i)} A_{it}^{\beta_4(i)} AR_{it}^{\beta_5(i)} D_{it}^{\beta_6} e^{\mu_{it}}}{\sum_{j=1}^{I} e^{\beta_0(j)} P_{jt}^{\beta_1(j)} PO_{jt}^{\beta_2(j)} Q_{jt}^{\beta_3(j)} A_{jt}^{\beta_4(j)} AR_{jt}^{\beta_5(j)} D_{jt}^{\beta_6} e^{\mu_{jt}}} \quad (7)$$

where $\beta_0(i)$ is the constant term, $\beta_1(i)$ is the price sensitivity of brand i, $\beta_2(i)$ is the market response to promotional expenditures for brand i, $\beta_3(i)$ is the market response to quality for brand i, $\beta_4(i)$ is the advertising effectiveness of brand i, $\beta_5(i)$ is the advertising effectiveness of advertising for "related brands" when brand i is a line extension, and β_6 is the market response to distribution.

We have hypothesized that, for a particular brand, the effectiveness of each of its marketing mix variables (except for distribution) is influenced by its order of entry into the market:

$$\beta_k(i) = f_k(O_i) \quad \forall k \in \{1, 2, 3, 4, 5\}.$$

This relationship can also be specified for the constant term $\beta_0(i)$ to represent an advantage for early entry beyond asymmetries in response parameters. More particularly, we hypothesized that the relationship between market response, $|\beta_k(i)|$, and order of entry is decreasing. The specific functional form of these relationships is not clearly derived from theory. A linear relationship is typically robust. However, a linear approximation is likely to be most valid in markets with few competitors where the order of entry variable does not take very large values. In markets with a large number of competitors, the marginal change in marketing mix effectiveness due to order of entry may be lower for later entry. That is, for example, the expected marginal change in response to quality for a competitor entering as the ninth brand versus entering as the eighth brand is less than the marginal change in response for a competitor entering as the third brand versus entering as the second brand. Such a relationship would be justified if increasingly crowded markets serve to attenuate the incremental penalties for later entry. Nonlinear relationships are, therefore, also examined.

A number of competing arguments for variation in the response to marketing mix efforts have been alluded to earlier. Elasticities may vary over time for reasons related to increased competition over time and related to nonobservable factors such as changes in consumer education. Traditional economics predicts that a market will become more competitive when the number of firms in the market increases—Hauser and Wernerfelt (1990) argue that the average number of brands considered by consumers is the relevant construct. Hence, the number of competitors in the market may influence the marketing mix elasticities of all the brands. Such an effect is likely to be most evident for large variations in the number of competitors over the observation period, and we need to control for that possible effect.

The above discussion leads to the process function that includes the order-of-entry term and a term to capture the effects of the number of competitors; Equations (8a) and (8b) show respectively a linear and a nonlinear specification:

$$\beta_k(it) = \alpha_{k0} + \alpha_{k1} O_i + \alpha_{k2} NC_t \quad (8a)$$

$$\beta_k(it) = \alpha_{k0} + \alpha_{k1} \ln(O_i) + \alpha_{k2} \ln(NC_t). \quad (8b)$$

An MCI model is a special case of a log-linear model and can be estimated using log-linear regression techniques: with appropriate dummy variables defined below, the ordinary least squares estimator is BLUE (best linear unbiased) (Cooper and Nakanishi 1988, Nakanishi and Cooper 1982). The process function (8a) leads to the following model to be estimated:[8]

$$\begin{aligned} \ln MS_{it} = {} & \beta_0 + \alpha_{10} \ln P_{it} + \alpha_{11} O_i \ln P_{it} + \alpha_{12} NC_t \ln P_{it} \\ & + \alpha_{20} \ln PO_{it} + \alpha_{21} O_i \ln PO_{it} \\ & + \alpha_{22} NC_t \ln PO_{it} + \alpha_{30} \ln Q_{it} + \alpha_{31} O_i \ln Q_{it} \\ & + \alpha_{32} NC_t \ln Q_{it} + \alpha_{40} \ln A_{it} + \alpha_{41} O_i \ln A_{it} \\ & + \alpha_{42} NC_t \ln A_{it} + \alpha_{50} \ln AR_{it} \\ & + \alpha_{51} O_i \ln AR_{it} + \alpha_{52} NC_t \ln AR_{it} \\ & + \beta_6 \ln D_{it} + \sum_{j=2}^{I} \delta_j BD_j + \sum_{u=2}^{T} \lambda_u TD_u + \mu_{it} \quad (9) \end{aligned}$$

where NC_t is the number of competitors in the market at time t, the BD_j's are brand specific dummy variables that take on a value of 1 if $j = i$ (0 otherwise), and the TD_u's are time specific dummy variables that take on a value of 1 if $u = t$ (0 otherwise).

[8] A similar equation results for the nonlinear process equation (8b).

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Table 2 **The Influence of Order of Entry on Marketing Mix Effectiveness**
Weighted Least Square Estimates

Variable	Process Function	Parameter Estimates	*t* Stat
Intercept*	constant	63.17[a]	13.32
	Sport Utility Vehicle	−37.93[a]	−9.81
	Category A[c]	−58.05[a]	−10.23
	Category B[c]	−70.59[a]	−14.69
	Category C[c]	−71.61[a]	−14.59
	ln(Order)	−0.06	−1.06
	ln(TimeMktDur)	0.40[a]	12.14
	ln(TimeMktNonD)	0.35[a]	5.77
Price	constant	−7.85[a]	−15.57
	Sport Utility Vehicles	1.05[b]	2.49
	Category A[c]	5.86[a]	8.30
	Category B[c]	5.04[a]	8.05
	Category C[c]	5.18[a]	6.92
	No. of Competitors[f]	0.31[a]	10.82
	Order	0.01[a]	11.54
Promotion	constant	0.17[a]	2.97
	Category A[c]	−0.02	−0.30
	Category B[c]	−0.12[a]	−2.79
	No. of Competitors[f]	0.02[b]	2.32
	Order	−0.03[a]	−4.84
Quality	constant	−0.26	−0.91
	Sport Utility Vehicles	−1.35[a]	−5.80
	No. of Competitors[f][%]	0.16[a]	6.44
	Order	−0.04[a]	−3.08

Variable	Process Function	Parameter Estimates	*t* Stat
Advertising	constant	0.01	−0.39
	Sport Utility	−0.07[a]	−7.41
	Vehicles	0.04[b]	2.05
	Category A[c]	0.07[a]	3.02
	Category B[c]	0.06[b]	1.96
	Category C[c]	0.01[a]	9.75
	No. of Competitors[f]	−0.01	−1.30
	Order		
Related Advertising	constant	0.36[a]	4.20
	Category B[c]	−0.31[a]	−3.72
	Category C[c]	−0.32[a]	−4.55
	No. of Competitors[f]	−0.01	−0.90
	Order	−0.02	−1.80
Distribution	constant	0.77[a]	9.94
	Sport Utility	0.03	0.42
	Vehicles	−1.36[b]	−2.02
	Category A[c]	0.37[a]	2.45
	Category B[c]	−0.15	−0.71
	Category C[c]		
R^2		NA	
ρ (predicted, actual)		0.81	
n		3729	

* time specific constants not shown.
[a] significant at 0.01 (based on two-tail tests).
[b] significant at 0.05 (based on two-tail tests).
[c] A, B, C correspond to the consumer packaged goods categories.
[f] Range for No. of Competitors: Sport Utility (9–21), Minivan (1–13), Category A (2–3), Category B (1–4), Category C (2–4).
[%] Quality data missing for the Sport Utility: NumComp < 13; Minivans: NumComp < 5.

The time-dummy variables account for the logarithm of the denominator of the MCI model, which is changing over time. Cooper and Nakanishi (1988) favor this model specification and estimation approach over the log-odds equation because of the ease of interpretation; the estimation of equation (9) yields identical parameter estimates than would be obtained using Theil's method based on the log-odds specification (Theil 1969). This interpretation is especially easier in the case of differential-effects models where the log-odds formulation does not reduce to simple differences of logarithms of the dependent variables relative to a base brand. In addition, the log-odds specification assumes that the pioneer (or any base/reference brand) remains in the market throughout the observation period. In fact, in a number of cases, the pioneer exists the market. The dummy variable specification of Nakanishi and Cooper (1982) allows for the pioneer to exit the market

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while observations would have to be deleted in the log-odds specification.

Consistent with previous studies, the model should capture the main effects of order of entry (e.g., Urban et al. 1986, Kalyanaram and Urban 1992). Thus, a constrained version of Equation (9), where the brand specific dummies are replaced with a variable capturing the main effects of order of entry, is estimated. The functional form of the main effects of order is consistent with that proposed by Urban et al. (1986). While order of entry, per se, has no interval properties, the decision to treat the variable this way is motivated by parsimony. Following Brown and Lattin (1994), we also include a time in market variable to capture the influence of advantages that accrue from consumer learning over time.[9]

While Equations (6) to (9) are expressed in terms of a single product category, following Kalyanaram and Urban (1992), we pool our data across markets. We estimate a fixed effects model that allows the intercept term and base response parameters to vary across markets which are represented by the subscript m:

$$\ln MS_{imt} = \beta_0(imt) + \beta_1(imt) \ln P_{imt} + \beta_2(imt) \ln PO_{imt} + \beta_3(imt) \ln Q_{imt} + \beta_4(imt) \ln A_{imt} + \beta_5(imt) \ln AR_{imt} + \beta_6(m) \ln D_{imt} + \sum_{j \in \text{Non-Durable}} \delta_j BD_j + \sum_{m=1}^{M} \sum_{u=2}^{T_m} \lambda_{um} TD_{um} + \omega_{imt} \quad (10)$$

where the process function for the intercept term is specified to include the main effects of order as

$$\beta_0(imt) = \alpha_{00}(m) + \alpha_{01} \ln O_{im} + \alpha_{02} \ln \text{TimeInMarket}_{imt} DD_{m1} + \alpha_{03} \ln \text{TimeInMarket}_{imt} DD_{m2}. \quad (11)$$

Here, O_{im} is the order of entry of brand i into market m, and $\text{TimeInMarket}_{imt}$ is the number of periods the brand has been in the market plus one. The intercept in the process function ($\alpha_{00}(m)$) is indexed by m to indicate that it would have a different parameter for each market estimated using dummy market variables. Because of differences in the observation interval (monthly versus weekly), a separate time-in-market parameter is estimated for durables and for nondurables. The dummy variables DD_{m1} and DD_{m2} reflect the two types of market in Equation (11). The fact that the number of competitors has an impact on market shares is implicitly modeled in the attraction specification, and there is no need to add this factor in Equation (11) because the term would cancel out with the same term which would appear at the denominator of the attraction equation (Equation 6).

Consistent with Urban et al. (1986), Kalyanaram and Urban (1992), and Brown and Lattin (1994), our model is a single equation. A Hausman test (Maddala 1988) indicated that distribution is exogenous. Further, even though some marketing mix variables, including distribution, could be a function of order of entry (e.g., Robinson and Fornell 1986), this leads to a recursive system so that Equation (10) can be estimated separately without biasing the parameter estimates (Dhrymes 1974).

Empirical Analysis and Results

As discussed earlier, in some markets sales of new brands experience a diffusion effect (Parker and Gatignon 1994). That is, initial sales are relatively low due solely to the fact that the brand is a recent entry into the market. Such an effect should diminish over time. A concern for our study is that a diffusion effect would depress the shares of later entrants during our observation period without corresponding to a real order of entry effect. To test for a diffusion effect in these data, we examined the number of periods it took for a new entrant to attain at least their average unit sales for the observation period. Most brands that entered during our observation period achieved sales at least equal to their average sales within the first few periods following entry. For those brands that took longer, the dataset still had at least two-thirds of the observations following the period in which the brand first exceeded its average sales.

Because the automobile industry typically introduces new models (under existing and new brand names) at

[9] We also tested, but did not find support, for a U-shaped influence of time in market—an investigation motivated by the discussion of brand retrieval processes in Kardes et al. (1993).

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regular intervals, annual seasonality patterns may occur, although the pattern applying to each competitor's market share data is less subject to seasonality than sales data. An examination of the autocorrelations and partial autocorrelations (especially of the twelfth order) indicated that seasonality is not present.

Because the product quality data is based on a survey of *Consumer Reports* readers and is published in April of each year, quality data were not available during the periods immediately following entry and for some brands with very small market shares. The missing data corresponds to lack of information about the variable for the brand at a given time period, which, therefore, has no effect on market share. We report the results of a model that includes an indicator of whether or not quality data was available.[10] Because the quality is measured on an interval scale and because of the multiplicative model specification, the quality data were transformed using Cooper and Nakanishi's (1983) zeta-squared transformation. Therefore, the variable Q_{imt} in equation (10) is expressed in terms of zeta-squared transformations.

The OLS estimators are consistent and unbiased. However, a likelihood ratio test of group-wise (across brands) heteroscedasticity (Greene 1993) rejects equal variances. Therefore, Weighted Least Squares estimators are more efficient and were used to estimate the parameters of equations (10) and (11). The linear process function (8a) model was estimated as well as the model with the logarithmic process function (8b) specification. A test of the functional form of the process function was performed. Because of the nonnested nature of the two models, the *J* test was used (Davidson and MacKinnon 1981, Greene 1993) and, in our empirical context, rejected the logarithmic process function specification.[11] In addition, the results indicated that the brand dummy coefficients for the nondurable markets had similar values within each market, although differences appeared larger across markets. A test of equality of coefficients (Chow 1960) within nondurable markets indicate that the restriction of equal coefficients for the brands within each category does not significantly impact the sum of squared residuals ($F = 1.3$; $df = 8{,}3132$; $p < 0.3$). This indicates no significant differences in the brand specific constant after controlling for order of entry and number of competitors, in spite of the lack of information on product quality. Consequently, the results of the more parsimonious model with market category dummy variables are presented in Table 2. Period dummies, which contribute to the fit of the model, represent the competitive activities. An analysis of residuals did not reveal outliers and the fit of the model to the data is similar to previously published models. The R^2 of the Weighted Least Squares regression is not interpretable in terms of percentage of explained variance (Judge et al. 1985). However, the R^2 obtained from OLS regression is 0.69. Also, the correlation between the actual market shares and the predicted market shares using the WLS estimates is 0.81.

Our hypotheses predict the direction (increasing or decreasing) of the influence of order of entry on a brand's marketing decision variables. As discussed earlier, in addition to including terms to capture the variation in marketing mix variables due to order of entry effects, the process functions also include terms to capture (potential) variation in response parameters due to the number of competitors in the market. We hypothesized that the relationship between market response, $|\beta_k(i)|$, and order of entry would be decreasing. The data tends to support the hypotheses.

[10] We also estimated our model on a data set that excludes observations with missing data. None of the signs of the significant variables changed and the magnitude of the coefficients remained similar. Therefore, we only report the estimation with the largest degrees of freedom.

[11] The procedure involves two tests. First, the linear model is assumed to be true (the null hypothesis). The alternative (logarithmic specification) model is estimated, and the predicted dependent variable is added to the linear model independent variables in a new model which is estimated. The coefficient of the predicted variable using the alternate model was insignificant ($t = 1.55$, $p < 0.13$), indicating that the linear model is not rejected. In a second step, the reverse procedure is applied where the null hypothesis assumes that the logarithmic process function specification is true. This model is estimated with the additional variable corresponding to the predicted dependent variable based on the estimated logarithmic specification of the process function. The coefficient of this last term is strongly significant ($t = 5.3$, $p < 0.01$), indicating that the null is rejected. These two statistics lead to the conclusion that the linear process function specification is statistically superior to the logarithmic specification.

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Table 3 Implied Influence of Order of Entry on Elasticities

Parameter	Market	Implied Elasticities at the Mean Market Share for Brands in the Category						
		At $N = 3$ Competitors			At $N = 12$ Competitors			
		1st Entrant	2nd Entrant	3rd Entrant	1st Entrant	2nd Entrant	3rd Entrant	12th Entrant
Price	Minivan	−6.089	−6.079	−6.070	−3.593	−3.583	−3.573	−3.484
	SUV	n.a.	n.a.	n.a.	−2.835	−2.825	−2.814	−2.719
	Category A	−3.796	−3.790	−3.784	n.a.	n.a.	n.a.	n.a.
	Category B	−1.214	−1.207	−1.200	n.a.	n.a.	n.a.	n.a.
	Category C	−1.199	−1.191	−1.183	n.a.	n.a.	n.a.	n.a.
Promotion	Category A	0.111	0.095	0.079	n.a.	n.a.	n.a.	n.a.
	Category B	0.057	0.038	0.019	n.a.	n.a.	n.a.	n.a.
	Category C	0.141	0.120	0.100	n.a.	n.a.	n.a.	n.a.
Quality	Minivan	0.378	0.343	0.308	1.616	1.582	1.547	1.234
	SUV	n.a.	n.a.	n.a.	0.451	0.414	0.377	0.044
Advertising (Brand)	Minivan	0.023	0.022	0.022	0.093	0.092	0.092	0.086
	SUV	n.a.	n.a.	n.a.	0.035	0.034	0.034	0.028
	Category A	0.037	0.036	0.036	n.a.	n.a.	n.a.	n.a.
	Category B	0.064	0.063	0.063	n.a.	n.a.	n.a.	n.a.
	Category C	0.062	0.062	0.061	n.a.	n.a.	n.a.	n.a.
Advertising (Related)	SUV	n.a.	n.a.	n.a.	0.318	0.302	0.287	0.145
	Category B	0.021	0.010	0.000	n.a.	n.a.	n.a.	n.a.
	Category C	0.017	0.005	0.000	n.a.	n.a.	n.a.	n.a.

na = Extrapolations outside the range of the data used for estimation are not shown.
* A, B, C correspond to the consumer packaged goods categories.

Price sensitivity is negative, and consistent with Hypothesis 1, decreases with order ($\alpha = 0.01$, $p < 0.01$). As expected, the effectiveness of quality is decreasing with order ($\alpha = 0.04$, $p < 0.01$), supporting Hypothesis 2. Also, consistent with our hypotheses, promotion effectiveness decreases with order of entry ($\alpha = 0.03$, $p < 0.01$). Although the coefficients are of the right sign for brand and related advertising, they are statistically insignificant.

In addition to modeling the sources of order of entry advantage as influencing the effectiveness of a brand's marketing mix efforts, the main effect of order remains negative, as found in previous research, but becomes insignificant. Consistent with the findings of Brown and Lattin (1994) and Huff and Robinson (1994), the time in market variable is positive and significant both for durables and nondurables ($\alpha = 0.40$, $p < 0.01$ and $\alpha = 0.35$, $p < 0.01$ respectively).

It is interesting to ask what influence order of entry has on the implied elasticities. Table 3 shows the implied elasticities (at the mean market share for the category) for the first, second, third, and (where applicable) twelfth entrant, for a market with four competitors and a market with twelve competitors. For example, depending on the product category, the promotion elasticity decreases between 29 and 67% from the first to the third entrant, indicating that the later entrant must have a significantly higher promotion level to obtain a similar share. Similarly, the elasticity for product quality decreases 24% from the first to the twelfth entrant in the minivan category and decreases 90% in the sport utility vehicle market. These results clearly demonstrate the managerial significance of these differences, although they are much smaller for price and brand advertising.

Furthermore, the sensitivity of market share to marketing mix is not only different across brands due to

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order-of-entry effects, as demonstrated above, but also the sensitivities for any brand change over time because of the changes in the competitive environment it is facing. Market share sensitivity to promotion (for nondurables), to product quality (for durables) and to advertising increases when facing competition from a larger number of brands ($\alpha = 0.02, p < 0.01, \alpha = 0.16, p < 0.01$ and $\alpha = 0.01, p < 0.01$, respectively). When facing competition from a larger number of brands, the price sensitivity parameter is significantly lower ($\alpha = 0.31$, $p < 0.01$). This result should, however, be interpreted with caution. Indeed, when more competitors enter the market, the market share of the incumbent firms is negatively affected, which results in higher price elasticity (which is the price sensitivity coefficient multiplied by one minus the market share). Therefore, the effect of the number of competitors on an elasticity depends on the market share impact of the entry as well as on the impact of the number of competitors on the sensitivity coefficient.

In addition, our results indicate that distribution penetration is a significant predictor of market share in all markets except one of the nondurable categories.[12] Our model does not exclude the possibility of order-of-entry effects due to the greater difficulty to obtain distribution for late entrants. In fact, a recursive effect is indeed significant when distribution penetration is modeled as a function of order of entry among a set of other explanatory variables. Given that these recursive effects have been reported in the literature and are independent, complementary to those investigated, we acknowledge these recursive effects without reporting the results.

Discussion

We have examined the influence of order of entry on the effectiveness of a brand's marketing decision variables. Controlling for differences in distribution, differences in the effectiveness of marketing mix efforts across brands are systematically related to order of entry. We hypothesized that the relationship between market response and order of entry would be decreasing. The hypotheses are tested using a multiplicative interaction model (e.g., Cooper and Nakanishi 1988) on data from five product categories. A significant order of entry effect is found supporting our hypotheses about the relationship between order of entry and market response to price, order of entry and the market response to quality, and order of entry and promotion effectiveness. Consistent with the empirical results of Ghosh, Neslin, and Shoemaker (1983) we find that market response to price is lower (less negative) for later entrants, *ceteris paribus*. We also find that market response to promotional expenditures for nondurables and product quality for durables are lower for later entrants. Finally, distribution appears as a significant predictor of market share which should be included in the model in order to avoid a misspecification bias of the other model parameters.

Contributions

We offer improvements over existing models (e.g., Robinson and Fornell 1985, Urban et al. 1986) and studies. First, we introduce new data which allow us to analyze the effect of order of entry on durables. Much of the analysis of order of entry effects has been based on either PIMS data or the Assessor database. Secondly, we have attempted to deal with survivor bias. Our observation period begins with entry of the pioneer in four of the five categories we examine. Thirdly, distinct from previous research our data sets permit the use of an absolute market share measure--we are not limited to examining the market share relative to the first entrant.

Our main contribution is in modeling the sources of order of entry advantage as asymmetries in response function parameters. Hence, distinct from previous research, we can explain why there are inherent order of entry effects and the special role of marketing mix activities.

Strategic Implications

Our results support previous research that demonstrate the advantages of early entry, and they provide guidelines for how later entrants should compete. First, later entrants have a disadvantage in competing on price; they need to change price by a larger amount than earlier entrants to attain the same change in market share. That is, later entry tends to decrease a competitor's price sensitivity. This result suggests that later entrants

[12] Although the coefficient of the dummy variable for distribution of this category is negative, when added to the constant distribution parameter (0.765), the sum is not statistically significant from zero.

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should not instigate a price war in an effort to gain share from pioneers. Also, later entrants, particularly if they occupy a market niche, are more likely to benefit from a price increase than pioneers. In fact, at a comparable level of market share, their price elasticity is lower and, therefore, their optimal price should be higher than the earlier entrants' price.

Secondly, order of entry tends to decrease the market response to quality and to promotion. This suggests that later entrants have a disadvantage in competing on quality/positioning attributes; they need a bigger change in product quality than earlier entrants. Similarly, later entrants must spend more on promotion than earlier entrants in order to achieve the same influence on market share. Although the results suggest similar tendencies for advertising, the data do not support an asymmetric impact of advertising: late entrants do not have a significantly different market share sensitivity to advertising than pioneers.

Much previous research has concentrated on modeling and explaining a main effect of order of entry. This study suggests that the main effects of order of entry are minimal. For the five markets we examined, the main effects of order of entry are lowered to insignificance. However, asymmetric responses in a brand's marketing mix efforts are a critical source of order of entry effects.

We conclude that order of entry effects are not insurmountable. That is, order of entry effects do not necessarily lead to lower shares: however, surmounting these effects is not without considerable cost to the late entrant.

Limitations and Future Research

Our results are subject to limitations. Although the analysis offers generalizability over multiple product categories, the number of durables is limited to two categories of automobile products—sport utility vehicles and minivans sold during 1983 through 1992. Future research should examine other durable markets. The measures used in this study are partial measures, although the variables in our analysis explain a significant proportion of the variance in market share. For the two automobile markets, the advertising effort measured in this study concerns brand level advertising by the manufacturer. It does not include any local advertising by individual dealerships. Also, the pricing data correspond to base prices and do not consider any differential discounting offered by different manufacturers or distributors. The disadvantage of being a late entrant may also depend on a number of factors not considered here. For example, the disadvantage may not be as great if the firm already has an entry in a similar or related product category.

Finally, examining alternative measures of firm performance such as economic profits could be useful (Lieberman and Montgomery 1988), especially since the relationship between market share and profitability has recently been questioned (Jacobson and Aaker 1985; Boulding and Staelin 1990). Also, a general substantive issue not yet addressed in the literature concerns the characteristics of pioneers who failed. Empirical analysis to date provides results only for pioneers who survived and were successfully imitated, with the exception of Glazer (1985). Our analysis is not subject to survival bias since we include data on all entrants, even if they exited the market. However, future research should focus on the characteristics of pioneers who failed. It is possible that the asymmetries identified in this study lead to costs for late entrants which might be hard to support for some companies and which lead them to exit the market. Indeed, this study brings strong support that asymmetries of the effectiveness of marketing mix variables across competitors is due *in part* to the order in which the brand entered the market, in addition to the recursive effects found in previous work.[13]

[13] The authors wish to thank Gurumurthy Kalyanaram and Glen Urban for granting the permission to use the data from their previously published study, and Pete Fader, Len Lodish, Bill Ross, and Tom Robertson for their feedback on an earlier draft of this paper. They are also endebted to the area editor and the reviewers.

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This paper was received April 7, 1994, and has been with the authors 241 days for 2 revisions.

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