

Staying Ahead in the Innovation Race: New-Product Introductions and Relative Firm Value

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ABSTRACT

While product innovation is a key contributor to long-term firm performance, new-product failure rate remains high, especially in the face of intense competition. Therefore, marketers need a better understanding of how and why firms benefit from new product activity relative to industry competitors. Which types of innovations have the greatest impacts on *relative firm value*? In particular, which innovation, brand, firm and market characteristics influence the long-term performance effects of new product introductions?

This paper addresses these questions with a large-scale empirical study on new-product introductions in the economically important automobile industry. First, vector-autoregressive models quantify the over-time impact of product introductions and promotional incentives on relative financial performance and firm value. Second, weighted least squares regression assesses the moderating role of innovation, brand, firm, and market characteristics.

A key finding is that new-product introductions can be managed strategically for competitive advantage in investor markets. Indeed, their relative performance impact is higher in growth categories, and especially for pioneering innovations that are highly advertised. In contrast, sales promotions do not offer such strategic benefits, as we find no meaningful moderators of their impact on relative market value.

Key words: Product innovation, long-term financial performance, long-term firm value, promotions, empirical generalizations, and vector-autoregressive models.

1. LONG-TERM INNOVATION EFFECTS ON FIRM VALUE

What drives long-run corporate performance? Several studies have identified innovation success as a key contributor to long-term firm sales, financial and stock market performance (Anderson and Zeithaml 1984; Comanor 1965; Kay 1979; Mansfield et al. 1971; Pauwels, Silva-Risso, Srinivasan and Hanssens, 2004). In the same vein, Drucker (1973) cites innovation and marketing as the two factors crucial to long-term corporate health. However, new-product failure rate is high (ranging from 33% to over 60%) and has not improved over the last decades (Boulding, Morgan and Staelin 1997, Business Week 1993, Wind 1982; McMath and Forber 1998). Moreover, both Main Street and Wall Street judge a new product not only on its own merits, but also on its value relative to competition (e.g. Bayus et al. 1997; Chaney et al. 1991). For example, Boeing' stock price surged 7% when it scrapped development plans for the 747X in January 1997, and declined 1.7% when the company revived the idea two years later - at a cost of \$4 Billion - to compete with the Airbus 380 (Wall Street Journal 1997, Dresdner Kleinwort Benson Research 2000).

Faced with high product innovation uncertainty and pressure for financial results,¹ managers want to focus on those innovations that persistently increase not only top-line performance, but also bottom-line and stock market performance for their firm relative to industry competitors (Financial Times 2004). Indeed, managers are often rewarded based on relative performance measures (Lev 1969), and are urged to 'run faster than competitors' in good times and bad times (D'Aveni 1994). As to the latter, while e.g. minor product improvements and sales promotions fail to raise firms out of an industry recession, they may enable them to outperform competitors and endure till better times

arrive. Therefore, “an increase in our understanding of how and why firms benefit from new product activity relative to industry competitors is an important area for future research” (Bayus et al. 2003).

This study examines how environmental and firm-strategy factors shape the long-term effects of product innovation and price discounting on *relative firm stock market* performance. For our empirical analysis, we focus on one industry in order to enhance the internal validity of our research (Prabhu, Chandy and Ellis 2005). We choose the car industry as a case in point, because of its economic importance and its reliance on both new product introductions and sales promotions. Indeed, the automobile business represents over 3% of the US Gross Domestic Product (J. D. Power and Associates 2002) and consumers have come to expect a steady stream of styling innovations (Menge 1962, Farr 2000). In this context, the main thrust of competition is in product development, with each company trying to compete in every segment of the market, “with a plethora of niche models designed to attract a particular group of consumers, and to renew them rapidly enough to keep interest fresh” (The Economist 2004, p.14).

However, the costs of such styling changes can be substantial (White 2001), and their success is far from certain (Farr 2000). Therefore, the large automobile firms face innovation investment decisions across distinct product ‘segments’, which differ in market attractiveness and competitive advantage factors. Finally, we believe that findings in this industry will be generalizable to other settings, as a recent meta-analysis finds little industry-specific effects of innovation performance and instead argues that, while high returns may not be sustainable in any particular market, the process of generating high returns can be sustainable (Capon et al. 1996, p. 214).

The remainder of this paper is organized as follows. Section 2 develops our conceptual framework, while section 3 presents our methodology. We introduce our dataset in chapter 4 and our empirical results in sections 5 and 6. Section 7 concludes with managerial implications and suggestions for future research.

2. DRIVERS OF FIRM VALUE IMPACT

In their extensive review of innovation and financial performance, Capon et al. (1996) describe a variety of competing explanations for superior firm performance that can be organized in market environment and firm-strategy factors. Among those, we focus on market, firm and product characteristics, which are better predictors than process characteristics, yet have not been analyzed as often (Hernard and Syzanki 1998). Furthermore, these competing explanations often require relatively complex statistical techniques for empirical analysis. In particular, it is important to use longitudinal analyses to assess the temporal stability of the key performance drivers (Montoya-Weiss and Calantone 1994) and because new-product performance persists over time (Capon et al. 1996, Pauwels et al. 2004). Thus, our conceptual framework should capture the main new product performance drivers identified in previous research, and our methodological framework should allow for persistent effects of changes in these performance drivers.

Cooper (1999) distinguishes two broad classes of critical success factors: doing the right projects, and doing projects right. Doing the right projects is captured by a number of external or environmental success factors that are crucial when selecting and prioritizing projects. Environmental factors include market potential and market competitiveness, while firm-strategy factors include company resources and product

advantage (Montoya-Weiss and Calantone 1994). Likewise, a recent meta-analysis revealed that superior firms (1) operate in high-growth markets with little and weak competition, (2) have exposure to international market, (3) attempt to enter markets early and thus secure more revenues in introductory/growth stage products, (4) spend more on R&D, and (5) spend a higher percentage of sales on advertising (Capon et al. 1996). Therefore, we analyze both environmental and firm-strategy factors suggested in previous research.

2.1 Market characteristics

How new-product introductions impact firm performance and therefore firm value depends critically on market characteristics such as market size, growth and concentration (Gatignon and Xuereb 1997). We examine these characteristics in turn.

2.1.1 Market size

The strength of market demand is an important factor in new product performance, and many firms neglect market size assessment at their own peril (Cooper and Kleinschmidt 1993; Henard and Szymanski 2001). A first component of demand strength is the overall size of the market or segment. Interestingly, market size may both benefit and harm the performance impact of a new-product introduction. On the one hand, large markets enable firms to spread their fixed R&D and launch costs over a greater number of potential customers. On the other hand, large markets are also important to competitors, and thus will draw more competitive innovation and attention.

H1: Market size increases the new product impact on firm value.

2.1.2 Market growth

When market demand is growing, it is easier for all competitors to acquire and retain customers and earn profits (Cooper 1999; Scherer 1980). Competitive reactions to new product introductions, for instance, are likely to be less aggressive when sales are growing at a satisfactory rate, which is true especially when the new products itself increase primary demand (Frey 1988). Likewise, advertising reactions to new product introductions are less likely in growing versus static markets (Cubbin and Domberger 1988). Furthermore, investors are likely to reward share gains in growing markets because the returns are expected to grow as the market grows (Day 1986). Market growth rate is an important indicator of new product performance in the long run, as incorporated in popular management tools such as the BCG matrix (Best 2004). Indeed, firms that target high-growth markets achieve higher sales and financial performance (Bayus and Putsis 1999, Capon et al. 1996). Therefore, we expect:

H2: Market growth rate increases the new product impact on firm value.

2.1.3 Competitive Structure

New product success also depends on the competitive conditions in the market, including market concentration (Copper and Kleinschmidt 1993; Capon et al. 1996). When faced with only a few competitors, firms can routinely monitor the competition, enabling them to react quickly (Bowman and Gatignon 1995). Such reaction may decrease the relative performance impact of new-product introductions in concentrated markets, which in turn, reduces their attractiveness to investors.

H3: Concentration decreases the new product impact on firm value.

2.2 Firm and brand characteristics

The industrial organization and marketing strategy literature place considerable emphasis on firm characteristics and how they can be used to compete, affecting new product performance (Day 1984; Narver and Slater 1990). Firm-strategy factors include both characteristics of the firm and firm-market synergies (Capon et al. 1996; Henard and Szymanski 2001, Montoya-Weiss and Calantone 1994).

2.2.1 Pioneering innovations

While new product introductions benefit firm value and profitability on average, more innovative products score a higher impact on firm value (Chaney et al. 1991, Pauwels et al. 2004). Indeed, relative advantage is a consistently important determinant of adoption rate (Holak and Lehmann 1990) and new-product success (Montoya-Weiss and Calantone 1994). Likewise, the pioneering nature of the firm's innovations indicates to what extent it is cutting edge (ibid). One classification of pioneering innovations is based on technological discontinuities that "advance by an order of magnitude the technological state-of-the-art which characterizes such industries" (Anderson and Tushman 1991, p 27). Highly innovative products "offer the possibility for greater long-term financial gain given the possibility of revolutionizing the category". Therefore, they will surpass moderately innovative products in terms of their profits and return-on-investment (Kleinschmidt and Cooper 1991; Pauwels et al. 2004). Moreover, investors may view such pioneering innovations both as platforms for future product introductions and as

signals that the firm is successful at the innovation process. Finally, pioneering innovations offer new strategic choices for the firm by providing the opportunity to leverage these to future products. For example, Dupont has leveraged their invention of nylon and Teflon in a series of successful new-product introductions in a variety of categories. In contrast to pioneering innovations, an innovation that is similar to existing products cannot be highly differentiated and therefore will not have a major advantage over existing competitors. Hence,

H4: Pioneering innovations increase the new product impact on firm value.

2.2.2 Perceived quality and appeal

In general, marketing theory predicts that a firm that serves the needs of its customers better, especially by providing products that are superior to the competition, will be more successful (Cooper 1999; Griffin and Hauser 1993). In other words, innovations that create and deliver added consumer value contribute significantly to the success of brands (Kashani et al. 2000). The new-product literature has consistently related innovation success to the relative advantage or the product's ability to provide benefits and features not offered by alternative products (Cooper and Kleinschmidt 1990, Hollak and Lehmann 1990, Henard and Szymanski 2001). Customer-focused measures of this relative advantage include customer appeal, quality and satisfaction. Investors are likely to respond to improvements in such customer perception scores (Aaker and Jacobson 1994).

H5: Perceived quality and appeal increase the new product impact on firm value.

2.2.3 Brand advertising

Investors value a product based on its likelihood of commercial success. The role of marketing investments in the success of new products has been well documented (e.g. Cooper and Kleinschmidt 1990, Cooper 1999). Specifically, advertising builds awareness, which is an essential component of new-product success. Firms that spend more marketing resources, such as advertising and promotional budgets, can better sustain the innovation and hence increase the adoption rate of their new products (Chandy and Tellis 2000). Indeed the marketing literature highlights new product introduction as requiring increased advertising spending (Bly 1993). Moreover, the investments in brand equity through advertising can reduce consumers' perceived risk, particularly for radical innovations (Dowling and Staelin 1994). Similarly, investors may view marketing investments such as new-product advertising as evidence of higher product quality, which in turn is associated with higher market value (Joshi and Hanssens 2004). Investors also react favorably to firms' shifting their strategic emphasis from value creation, i.e. innovation and product development activities; to value appropriation, i.e. extracting profits in the marketplace through more intensive product marketing (Mizik and Jacobson 2003). Hence, we hypothesize that:

H6: Investments in brand advertising increase the new product impact on firm value.

2.2.4 Firm market share

The firm's current market share in a category may impact the long-term performance impact of its innovations in several ways. A firm's high market share within a served segment typically results from a strong relative advantage in that segment (Phillips,

Chang and Buzzell 1983). Insofar as this position brings with it a strong vested interest in and commitment to that market due to its strategic importance for the firm, market share could enhance new-product effectiveness. At the same time though, dominant firms 1) have more to lose from cannibalization, which could jeopardize the price premiums on their established products, and 2) are prone to inertia (Ghemawat 1991, Chandy and Tellis 2000). Similarly, firms with a large share of a category may become complacent in that market as their managerial priorities shift to other, higher-growth opportunities (Kashani 2003). Other studies claim that incumbents are slow not only in introducing radical innovations, but also lag the industry in introducing minor changes (Henderson and Clark 1990).

H7: Dominance in a segment decreases the new product impact on firm value.

Last but not the least, an important contributor to new product effectiveness is the role of firm-specific heterogeneity in providing a sustainable competitive advantage (e.g. Wernerfelt 1984). For instance, the greater the resources of the firm, the more the market power, which is a competitive advantage that translates into great effectiveness of the new product introduction. These advantages can be in part due to the ability to invest greater resources into the design of superior new product innovations. The finance literature suggests that larger firms face less risk and that the market uses a smaller discount rate when evaluating their future prospects (see e.g. Aldrich and Auster 1986). While we control for firm-specific heterogeneity by including firm-specific dummy variables, we do not advance hypotheses for these effects. Instead, we will discuss the firm-specific findings in an exploratory fashion.

Our research framework outlined above is summarized in Figure 1.

---Insert Figure 1 about here ---

In summary, previous literature enabled us to identify factors that may moderate the impact of new product introduction on firm value. In contrast, little research exists on moderating factors of the firm value impact of promotions, despite their rising prominence in many industries. Therefore, we investigate how the promotional impact on firm value depends on the same market, firm and product factors.

In summary, the extant literature suggests that relative innovation plays an important role in explaining the sales, financial and stock market performance of firms.

3. RESEARCH METHODOLOGY

In order to enable comparison with previous findings, the econometric modeling of innovation and promotion effects is based on the approach used in Pauwels et al. (2004). We follow a three-step procedure. First, we perform unit-root tests for each brand's performance and marketing variables. Second, based on the test results, we include the performance and the marketing variables in Vector Autoregressive (VAR) models, as presented in equation 1. We operationalize stock market performance as the firm's market-to-book ratio (Miller and Modigliani 1961, David et al. 2002). Earnings are measured as earnings from operations (Allyannis and Weston 2003). Second, based on the coefficient estimates, we derive impulse response functions to quantify the over-time effects of product innovations on the performance variables. Finally, we relate the long-term performance effects of new products to the car model's innovation strategy in a

weighted-least squares regression in order to verify our proposed hypotheses (see e.g. Srinivasan et al. 2004).

Following the results of unit-root tests in Step 1, the VAR model for each brand j in category k from firm i , is specified as

$$\begin{bmatrix} \Delta RVBR_{i,t} \\ \Delta RINC_{i,t} \\ \Delta RREV_{i,t} \\ RNPI_{ijk,t} \\ RSPR_{ijk,t} \end{bmatrix} = C + \sum_{n=1}^N B_n \times \begin{bmatrix} \Delta RVBR_{i,t-n} \\ \Delta RINC_{i,t-n} \\ \Delta RREV_{i,t-n} \\ RNPI_{ijk,t-n} \\ RSPR_{ijk,t-n} \end{bmatrix} + \Gamma \times \begin{bmatrix} \Delta S \& P500_t \\ \Delta Construct_t \\ \Delta Exchange_t \\ \Delta EPS_{i,t} \end{bmatrix} + \begin{bmatrix} u_{VBRI,t} \\ u_{INCI,t} \\ u_{REVI,t} \\ u_{NPijk,t} \\ u_{SPRijk,t} \end{bmatrix} \quad (1)$$

with B_n , Γ vectors of coefficients, $[u_{VBRI,t}, u_{INCI,t}, u_{REVI,t}, u_{NPijk,t}, u_{SPRijk,t}]' \sim N(0, \Sigma_u)$, N the order of the VAR system based on Schwartz' Bayes Information Criterion (SBIC), and all variables are expressed in logarithms or their changes (Δ). In this system, all of the variables are defined relative to competition. Such relative marketing and performance benchmarks enjoy a long tradition in both marketing (Cooper and Nakanashi, 1988; Carpenter et al. 1988) and finance (Lev 1969). Table 1 provides details on the operationalization of the variables in the VARX model.

---Insert Table 1 about here ---

The first equation explains changes to firm value,² operationalized as the ratio of the firm's market value to book value ($RVBR$) (Miller and Modigliani 1961), defined relative to the competition. This variable reflects a firm's potential growth opportunities and is used frequently for assessing a firm's ability to achieve abnormal returns relative to its investment base (David et al. 2002). The second and third equations explain the changes in, respectively, bottom-line ($RINC$) and top-line financial performance ($RREV$) of firm i . The fourth and fifth equations model firm i 's marketing actions, i.e. new-product introductions ($RNPI$) and sales promotions ($RSPR$) for brand j in product category k .³

Note that in this VAR model, all endogenous variables are specified in relative-to-competition terms; thus, competitive activity is endogenous in our model.⁴ In addition, we estimated as the benchmark model, the VAR model specified in Pauwels et al 2004 (equation 1), with the same variables in absolute terms. This benchmark model facilitates comparisons with our 'relative-to-competition' model.⁵

We control for seasonal demand variations in the vector C (Labor Day weekend, Memorial Day weekend and the end of each quarter), and for fluctuations in the overall economic and investment climate (S&P 500, Construction Cost index⁶ and dollar-Yen exchange rate).

The VAR model (1) is estimated over three separate time windows -- June 1996- June 1998, June 1998- June 2000 and June 2000- June 2002 for the brands outlined in Table 2. As a result, 159 sets of VAR parameters and corresponding impulse-response functions are estimated and set aside for the weighted-regression models in the third step of this research.

4. DATA DESCRIPTION AND VARIABLE OPERATIONALIZATION

We focus our analysis of the 1996-2002 automobile industry on Chrysler, Ford, General Motors, Honda, Nissan and Toyota, representing about 86% of the U.S. car market. Our data come from four major sources, J.D. Power & Associates (JDPA) for weekly sales and marketing, CRSP and COMPUSTAT for firm performance, and I/B/E/S for earnings.

Sales transaction data from J.D. Power & Associates are available for a sizeable sample of dealerships in the major metropolitan areas in the US. We use data from California dealerships, containing every new car sales transaction in a sample of 1,100 dealerships from October 1996 through June 2002. The detailed data for this region are

representative of other US regions, whose data periods are shorter. Each observation in the JDPA database contains the transaction date, the manufacturer, model year, make, model, trim and other car information, the transaction price, and sales promotions, operationalized as the monetary equivalent of all promotional incentives per vehicle. Moreover, this dataset is at the detailed ‘vehicle’ level, defined as every combination of model year, make and model (e.g., 1999 Honda Accord, 2000 Toyota Camry), body type (e.g., convertible, coupe, hatchback), doors (e.g., 2 door, 4 door, 4 door extended cabin), trim level (e.g., for Honda Accord, DX, EX, LX, etc.), drive train type (e.g., 2WD, 4WD), transmission type (automatic, manual), cylinders (e.g., 4 cylinder, V6), displacement (e.g., 3.0 or 3.3 liters) (Scott Morton, Zettelmeyer and Silva-Risso 2001). The vehicle information is aggregated to the brand level, representing a company’s presence in a certain category. For example, Chevrolet, GMC and Cadillac are the three General Motors brands in the SUV category.

A second source of JDPA data is expert opinions on the innovation level of each vehicle redesign or introduction. In line with the JDPA (1998) guidelines, these experts rate such innovativeness on the 5-point scale presented in Table 2.

--- Insert Table 2 about here ---

Our innovation scale ranges from mere trimming and styling changes (levels 1 and 2) to ‘design’ and ‘new benefit’ innovations (levels 3 and 4) to brand entry in a new category (level 5). An example of level 1 is the 2002 Toyota 4Runner with minor exterior styling changes, of level 2 is the 1999 Ford Explorer with minor updates to interior and exterior, of level 3 is the 1998 Isuzu Rodeo with a major change to vehicle platform, of level 4 is the 2001 Ford Explorer with a major change to a new platform and with additional ‘third-row’ seating and, of level 5 is the 2001 Acura MDX. Furthermore, when there are no visible changes between model years, an innovation value of zero is

assigned.⁷ These expert ratings operationalize our variable ‘new-product introduction’, timed at the moment of their launch in the market. Innovation is defined at the brand level as the *maximum* innovation level for all the brand’s vehicle changes in that particular week.⁸

We consider 53 brands in six major product categories: SUVs, minivans, mid-size sedans, compact cars, compact pickups and full-size pickups as shown in Table 3.

--- Insert Table 3 about here ---

Our measure of firm value is based on the comprehensive data set of firm market capitalization and daily market indices (S&P500) of the NYSE obtained from the Center for Research in Security Prices (CRSP). For firm-specific information and quarterly accounting information such as book value, revenues and net income, we use the Standard and Poor's 1999 COMPUSTAT database as in Pauwels et al. (2004). Additionally, the COMPUSTAT dataset also provides monthly indices of the Construction Cost Index and the Consumer Price Index (CPI). The CPI is used to deflate all monetary variables. Finally, the I/B/E/S database provides quarterly analyst’ earnings forecasts for the six major manufacturers in this study, Chrysler, Ford, General Motors, Honda, Nissan and Toyota, representing about 86% of the U.S. car market. Table 4 shows that, during the period of observation, some of these categories experienced an abundance of major and minor innovations (SUVs and full-size pickups) or a dominance of major innovation (minivans), others saw a more moderate amount of innovation (mid-size and compact cars) and yet others were characterized mainly by minor changes (compact pickups).

--- Insert Tables 4 and 5 about here ---

Table 5 provides a listing of the brands in the study along with the descriptive statistics for the measures that form the basis of our analysis. The operationalization of the market, brand and firm characteristics is summarized in Table 6.

--- Insert Table 6 about here ---

For the “pioneering” innovation variable, in line with the JDPa (1998) guidelines, JDPa experts rate such innovativeness as pioneering (level=1) or not (level=0). An example of level 1 for the premium car category is the 2001 Toyota Prius, the first gasoline-hybrid that could function as a versatile family car. In the truck category, examples of pioneering innovations are: i) the 2002 Chevrolet Avalanche series, which by incorporating a unique convertible cab system could transform itself from a five-passenger sport-utility with a 5-foot-3-inch bed, into a standard cab pickup with a full 8-foot-1-inch utility bed and, ii) the 2002 Lincoln Blackwood, introduced by Ford as a cross between a luxury SUV and a pickup truck. Turning to the SUV category, examples of pioneering innovation are: i) the 1999 Lexus RX300, the first car-based SUV designed to compete in the luxury SUV segment and, ii) the 1998 Dodge Durango, the first mid-size SUV to offer eight-passenger seating in its class, i.e., providing minivan functionality, while offering the most cargo space in its class and three-and-a-half tons of towing capacity. In fact, the Dodge Durango was considered the most versatile sport-utility on the market at launch. Finally, turning to the minivan category, an important pioneering innovation is the 1999 Honda Odyssey, which introduced a remarkable feature for the first time: its hideaway, or "magic" seat.

5. EMPIRICAL RESULTS

The 159 estimated VAR models, (for each of the 53 brands in each of the 3 time windows), with the number of lags selected by the SBIC showed good model fit (the F-statistic ranges from 4.13 to 13.78, and the R^2 ranges from 0.22 to 0.72).⁹ We first review our results on the performance impact of new-product introductions and sales promotions of the benchmark model, which is the model estimated in Pauwels et al. (2004). Next, we discuss how these effects differ for the relative-to-competition models. Finally, we examine what brand, market and firm characteristics impact the long-term effects of product innovation and price discounting on firm value.

5.1 Impact of new-product introductions and sales promotions on firm value --

Benchmark model

Table 7 shows the frequency of positive stock-market performance effects for brand-level product introductions and promotions on firm-level performance¹⁰ over all 53x3 brands/windows for six categories and six companies. While short-run firm value effects can be different across categories, they are positive for the most part. The long-run effects of new-product introductions show a predominantly positive effect on firm value in each of the six categories. Over the total sample, new-product introductions have a positive long-run impact on market capitalization for 78% of all brands, confirming the previous findings in Pauwels et al. (2004).

--- Insert Table 7 about here ---

Turning to sales promotions, while there is considerable entropy in the short run, the effects of sales promotions on firm value are negative in the long run for over 60% of the brands, once again confirming the findings in Pauwels et al. 2004. This result does not

necessarily imply that firms should abstain from sales promotions, which may be the only means of bridging the long lead-time till the next great new product. In such cases, sales promotions may temporarily correct gaps between demand and supply, and thus keep the factories running.¹¹ This scenario is consistent with our findings, as financial markets apparently recognize that sales promotions signal the firm has fallen behind in the innovation race. In other words, our results should not be interpreted to mean that eliminating promotions would increase firm value.

Next, we examine the effect of new product introductions and promotions on performance relative to competition, using the VAR model specified in equation (1).

5.2 Impact of new product introductions and sales promotions on relative firm value

The effects of *relative* innovation and promotions on the *relative* performance levels are summarized in Table 8.

--- Insert Table 8 about here ---

Overall, the short-run effects are similar, as both innovation and promotion effects have high entropy. However, the long-run effects differ from those of the benchmark model on *absolute* levels of performance and marketing activity. The frequency of positive new-product effects in the long run is only 64%, as compared to the 78% for the benchmark model. Similarly, the incidence of positive incentive program effects in the long run is 58%, as compared to 41% for the benchmark model. Thus, relative to competition analysis suggests that innovations are not as predominantly *beneficial* and sales promotions are not as predominantly *detrimental* across all brands and categories. The former finding reflects the highly competitive nature of the car industry, where firm value benefits are partly negated by competitive innovations. The latter finding confirms

managerial rationale for sales promotions to strengthen their position relative to competitors, even when they fail to raise absolute firm value.

Second, for both new product introductions and promotions, the relative effects on firm value *differ significantly across brands and categories*. Accordingly, a relevant question from a manufacturer's standpoint is: what are the drivers of firm value impact of innovations and promotions? In general, we expect that this finding is moderated by several characteristics of the brand and market.

6 SECOND-STAGE ANALYSIS: MODERATORS

Our first-stage results on firm value impact reveal that, on average, innovations and price promotions are not equally beneficial across brands and categories. The second stage explores the drivers of innovation and promotional impact on firm value. As such, we try to take maximum advantage of both the temporal (first stage) and cross-sectional (second stage) richness of the data. While prior marketing theory outlined in Section 2 drives our second-stage analysis for innovation effects, in contrast, our analysis of promotion effects is exploratory in nature. Econometrically, the second stage uses weighted least-squares estimation on three second-stage equations, using the firm value impact as the dependent variables. The weights are the inverse of the standard errors of the dependent variables, and account for the bias caused by statistical error around our first-stage estimates. The findings of this second-stage analysis are presented in Table 9.¹²

--- Insert Table 9 about here ---

6.1 Drivers of innovation effects on firm value

6.1.1 Market characteristics

Table 9 shows that the total new product introduction effect is moderated by two market characteristics: category growth and concentration. First, the higher the market growth rate, the higher is the impact of new products on firm value, which supports hypothesis H2. Thus, market growth is an important indicator of new product performance in the long run. Consequently, investors reward firms that target high-growth markets. This finding extends previous literature on the positive relation between market growth and sales performance (Bayus et al. 2001; Capon et al. 1996).

Second, the higher the market concentration, the lower the impact of new products on firm value, consistent with hypothesis H3. In concentrated markets, a new product introduction poses a threat to competitors' profitability and thus competitors are more likely to react faster and more aggressively (Bowman and Gatignon 1995). Hence investors reward new product introductions in such categories to a lesser degree.

In contrast to hypothesis 1, market size does not significantly affect the firm value impact of new product introductions. As we suggested before, large market benefits may be offset by higher competitive attention to these markets.

6.1.2 Firm and Brand characteristics

Consistent with hypothesis 4, pioneering increases the firm value impact of product innovation. Investors indeed reward such pioneering innovations both as platforms for future product introductions and as signals that the firm is successful at the innovation process. Overall, truly innovative breakthroughs achieve considerable long-term benefits. For example, the introduction by Toyota of the first car-based luxury SUV (Lexus RX 300) was instrumental in Lexus achieving the leading position in the US

luxury market. Thus, we find that investors value a firm's pioneering innovations because they are viewed as more rewarding despite higher risks (Kashani et al. 2000).

The higher the brand advertising expenditure, the higher the impact of new product introductions on firm value, as hypothesized in H6. This suggests that investors reward innovative firms that put greater emphasis on extracting profits from their innovations, i.e. value appropriation, supporting the findings of Mizik and Jacobson (2003).

As for market share, the higher the market-share dominance in a category, the lower the new-product performance impact on firm value (H7). This result supports previous findings that dominant firms in a category are less likely to have success in innovations (Chandy and Tellis 2000). There are three possible explanations for these results. First, new product introduction effectiveness can be lower for dominant firms since they have more to lose from cannibalization. In addition, such new-product introductions may affect the premium such firms can extract from their current products. Moreover, dominant firms in a category are prone to inertia causing them to be less aggressive in innovations. In contrast, firms that are not dominant in a given category may work assiduously at improving their market standing and are rewarded by investors accordingly.

As for the brand's perceived appeal and quality, these are not significant, contrary to hypothesis H5. A possible explanation is that JD Power and Associates' perceived appeal and quality ratings are obtained from *current* vehicle owners of the automobile brand. Even though such subjective performance measures are the most commonly used in marketing strategy research (Gatignon and Xuereb 1997), it should be noted that those surveys are not intended to capture how consumers who do not own the car perceive its appeal and quality. Hence, our findings on these effects are not entirely surprising.

Finally, an important contributor to new-product effectiveness is the role of firm-specific heterogeneity in providing a sustainable competitive advantage (e.g. Wernerfelt 1984). Our findings suggest that the two manufacturers that are rewarded significantly more by investors are General Motors and Toyota. We offer two possible explanations for this finding. First, GM and Toyota are the two largest auto manufacturers, in terms of sales revenues and market shares, in the global marketplace. Thus they enjoy superior economies of scale in manufacturing, R&D, advertising and communication and distribution networks, relative to their smaller competitors. Second, GM and Toyota have the most complete line-up in all the segments of the market, relative to the competitors. Hence, they can reap greater benefits from economies of scope in new-product introductions, as compared to their competitors. Moreover, investors may recognize that these two firms can better spread the new-product investment costs over their complete line-up, resulting in higher overall firm value effects.

6.2 Drivers of promotional effects on firm value

Table 9 shows that the total promotional impact on firm value is moderated only by *category growth rate*. Indeed, the lower the category growth rate, the higher the total promotional impact on firm value. Such low-growth rates are typical for the maturity or decline phase of the product life cycle and therefore would not be good candidates for major new-product introductions. Consequently, investors may reward price promotions as a necessary tool to maintain the brand's competitive position in such markets. Conversely, de-emphasizing price promotions may weaken the firm's market position in an already saturated market.

Overall, a striking contrast in the second-stage analysis is that there are important brand- and market- specific factors associated with product innovation impact, but not

promotional impact. Thus only new-product introductions can be managed strategically for competitive advantage in investor markets. The main findings on these drivers are summarized in Table 10.

---Insert Table 10 about here---

7. CONCLUSIONS AND MANAGERIAL IMPLICATIONS

This paper has investigated the impact on firm value of new product introductions. The breadth of the sample allows us to derive empirical generalizations on relative innovation and promotion effectiveness¹³ and its drivers. We group our findings on the firm value effects of new product introductions, promotions and moderators of these effects, and summarize as follows:

- (i) Focusing on *absolute* performance levels, new product introductions have positive effects on firm value.
- (ii) While investors typically view product introduction favorably, what really differentiates firms is the extent of innovation *relative to competition*. Not all firms benefit equally from new product innovations. It appears especially important to analyze firm value benefits relative to competition, as the findings differ from previous literature on absolute effects. Indeed, relative to competition analysis suggests that innovations are not as predominantly *beneficial* and sales promotions are not as predominantly *detrimental* across brands and categories.
- (iii) There are significant moderators of product innovation effectiveness. First, firm value impact of new-product introductions is higher in high-growth categories that are less concentrated. Second, firm value impact of new-product introductions is higher for pioneering innovations that are backed with high

advertising investments. Thus, *pioneering brands that create and deliver differentiated added value to consumers enjoy a higher firm value effect of their innovations*. Third, firm value impact of new product introductions are higher for firms with a smaller share of the category. Thus while the race for innovation advantage applies to both category leader and challengers, the stakes are by no means the same. Unlike the dominant brands in a market, smaller players that pull ahead of the competition gain a significant boost in firm value. Thus, our findings suggest that new-product introductions can be a strategic way for firms to build competencies in new categories.

- (iv) Finally, while there are important brand- and market- specific factors associated with product-innovation effectiveness, we have not found such systematic drivers for promotional effectiveness. Consistent with current industry practice, sales promotions appear the one-size-fits all solution to bridge the gaps between supply and demand.

This study has several limitations that provide interesting avenues for future research. First, we analyzed only one industry, albeit one in which product innovation and consumer incentives are a major part of marketing strategy. A validation of our results in other industries is an important area for future research. Second, researchers may investigate consumer acceptance ratings prior to launch and thus may help predict the performance impact of specific innovations. Third, future research could allow for non-linear relations between innovation and promotional impact and the second-stage characteristics, as well as the potential endogeneity of these characteristics. Finally, we did not consider launch strategy or innovation process measures, both of which have been

researched extensively in the past.

In conclusion, the marketing literature to date has provided a number of insights on the benefits and risks of product innovation for consumers and firms. This research adds an important dimension to this knowledge: the investor community rewards innovative firms by their willingness to pay a premium in valuation, and this premium depends on the innovations of the firms *relative to competition*. Furthermore, innovation policy can be managed strategically for competitive advantage in the investor markets, since there are important brand- and market- specific factors associated with their effectiveness.

Staying ahead in the innovation race and continuing to invest in enhanced consumer value relative to competitive offers are thus key imperatives from an investor standpoint. Moreover, while innovations have a *positive* impact on firm value, the impact may turn out to be *negative* if the firm fails to manage innovation strategically. First, an innovation that is similar to existing products (i.e. is not a pioneering innovation) cannot be highly differentiated and therefore will not provide a major advantage over existing competitors. Such innovations will fail to increase relative firm value. Second, if a firm does not invest in communicating the differentiated value provided by its innovation, this could undermine the firm value impact of the innovation. Third, dominant firms may become complacent in their market, which creates opportunity for smaller market challengers. In other words (The Economist, 2004, p.22), “the old car firms must reinvent themselves to seek profit, not just market share. Otherwise new, nimbler competitors will take advantage of technological change to do the job for them.”

Figure 1 Research Model

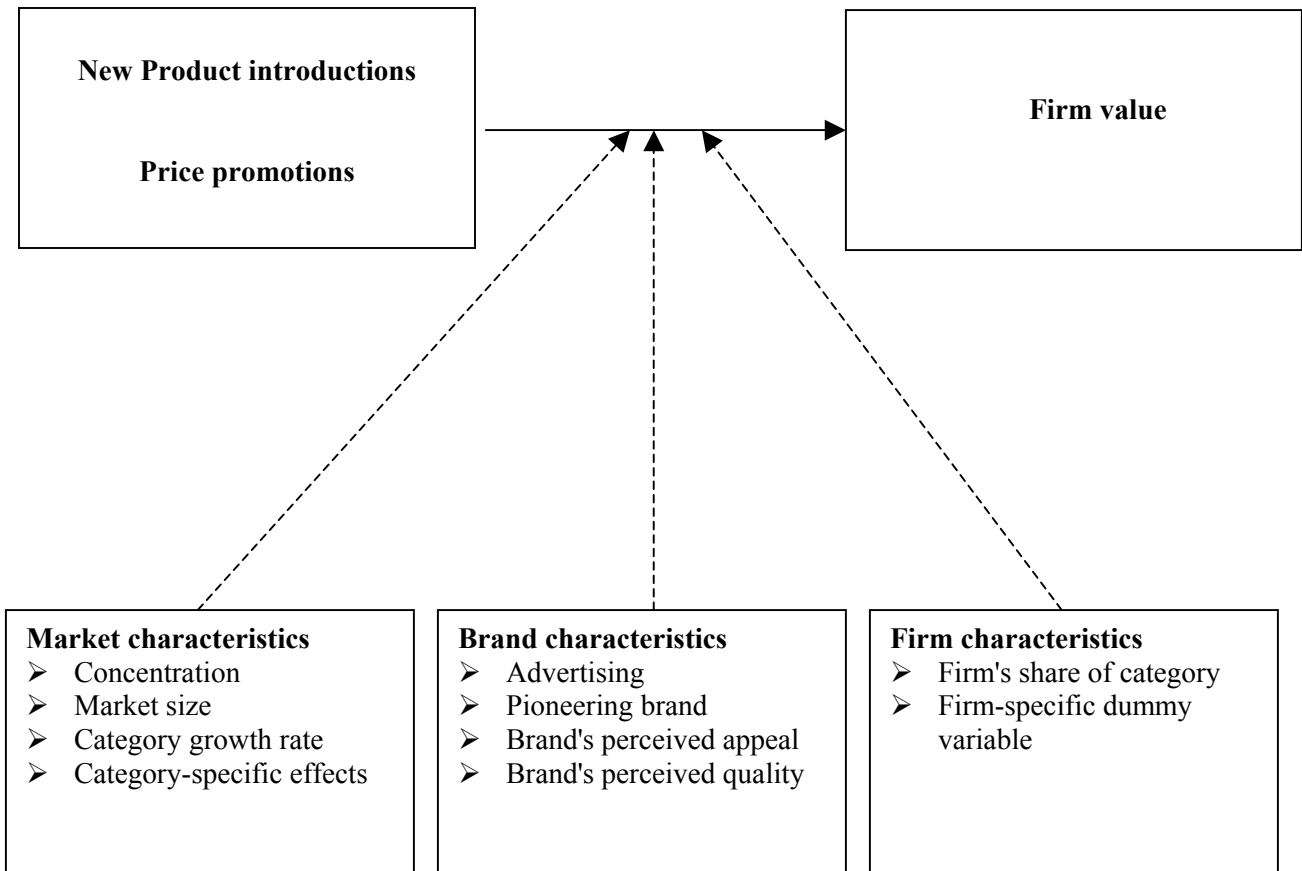


Table 1 Measures, operationalization and data sources

<i>Measure</i>	<i>Variable</i>	<i>Endogeneity</i>	<i>Operationalization</i>	<i>Data sources</i>
Relative Firm value	$RVBR_{i,t}$	Endogenous	The ratio of the firm i 's market value to the sum of market value of competing firms.	CRSP
Relative Top-line performance	$RREV_{i,t}$	Endogenous	The ratio of the firm i 's revenue to the sum of revenues of all competing firms .	COMPUSTAT J.D. Power transactions
Relative Bottom-line performance	$RINC_{i,t}$	Endogenous	The ratio of the firm i 's income to the sum of income of all competing firms.	COMPUSTAT J.D. Power transactions
Relative Product innovation	$RNPI_{ijk,t}$	Endogenous	The brand innovation variable is defined at the 'brand level' as the maximum of the innovation variable for all 'vehicle' transactions for brand j in category k in a particular week. Relative product innovation is the ratio of brand's innovation level to the sum of brand innovation for all competing brands in category k .	J.D. Power expert opinion J.D. Power transactions
Relative Sales promotions	$RSPR_{ijk,t}$	Endogenous	The monetary equivalent of all promotional incentives for brand j in category k in a particular week (relative to brands of competing firms in category k). Relative sales promotions is the ratio of sales promotion of the brand to the sum of sales promotions for all competing brands in category k .	J.D. Power transactions
S&P 500	$S\&P\ 500_t$	Exogenous	The S&P 500 index	CRSP
Construction Cost Index	$CONSTRUCT_t$	Exogenous	The construction cost index	CRSP
Dollar-Yen exchange rate	$Exchange_t$	Exogenous	The dollar \$/Yen ¥ exchange rate	Federal Reserve's Foreign Exchange (FX)

Table 2 **JDPA expert rating scale on innovation level for car model changes**

<i>Innovation scale</i>	<i>Innovation Level Description</i>
0	No visible change
1	only styling change, affecting grille, headlight and taillight areas
2	minor changes affecting sheet metal in front and rear quarter areas and minor changes to interior, but not to the instrument panel
3	major changes affecting exterior sheet metal and considerable change to interior, including instrument panel
4	all new sheet-metal including the roof panel, e.g. new platform or change from rear-wheel to front-wheel drive
5	new entry into the market

Table 3 Brands of the six leading car manufacturers

Category	Chrysler	Ford	General Motors	Honda	Nissan	Toyota
Sport Utility Vehicle (14)	Dodge, Jeep	Ford Lincoln	Chevrolet, Cadillac, GMC, Oldsmobile, Buick	Honda	Nissan Infiniti	Toyota Lexus
Minivan (9)	Dodge, Chrysler	Ford Mercury	Chevrolet, Oldsmobile	Honda	Nissan	Toyota
Premium Mid-size cars (9)	Chrysler	Ford Mercury	Chevrolet Oldsmobile, Buick	Honda	Nissan	Toyota
Premium Compact cars (8)	Chrysler	Ford	Chevrolet, Pontiac Saturn	Honda	Nissan	Toyota
Compact Pick-up (6)	Dodge	Ford	Chevrolet, GMC		Nissan	Toyota
Full-size Pick-up (7)	Dodge	Ford Lincoln	Chevrolet, GMC, Cadillac			Toyota

Table 4 New product introductions in six car categories

<i>Category</i>	<i>Major innovations (Levels 3-5)</i>	<i>Minor innovations (Levels 1-2)</i>	<i>Total</i>
Sport Utility Vehicle	93	55	148
Minivan	26	6	32
Premium Midsize	23	19	42
Premium Compact	27	24	51
Compact pick-up	21	32	53
Full-size pick-up	72	35	107
Total	262	171	433

Table 5 Characteristics of the six leading car manufacturers Oct. 1996-Dec. 2001

<i>Characteristic</i>	<i>Chrysler*</i>	<i>Ford</i>	<i>General Motors</i>	<i>Honda</i>	<i>Nissan</i>	<i>Toyota</i>
Brands	Dodge, Jeep Chrysler	Ford Lincoln	Chevrolet, Cadillac GMC, Buick, Saturn	Honda Acura	Nissan Infiniti	Toyota Lexus
Number of models	15	16	30	9	9	19
US Market share	15%	21%	28%	8%	4%	10%
Market capitalization (\$ M)	48310	52475	41770	36100	15360	119140
Market capitalization to Book value	1.91	2.36	1.90	2.29	1.51	2.16
Quarterly firm earnings (\$ M)	845	1612	988	559	-108	1079
Quarterly firm revenue (\$ M)	29120	39520	43355	12792	13065	26780
# major introductions (Levels 3-5)	40	82	68	25	17	30
# minor introductions (Levels 1-2)	33	43	32	21	11	31
Sales promotions per vehicle (\$)	640	390	640	25	200	120

* Chrysler's merger into Daimler-Chrysler (October 1998) is accounted for in the Chrysler VAR model by including dummy variables (see Nijs et al. 2001 for a similar treatment of exogenous variables).

Table 6 Market and Firm-Specific Variables, operationalization and data sources

<i>Variables</i>	<i>Variable</i>	<i>Operationalization</i>	<i>Data sources</i>
Market size	$MKTSIZE_{k,t}$	The segment sales in \$s and units for category k	J.D. Power
Market growth	$GROWTH_{k,t}$	Segment sales growth rate for category k	J.D. Power
Segment concentration	$CONC_{k,t}$	Market-share of top-three brands in category k	J.D. Power
Brand advertising	$ADV_{ijk,t}$	Advertising for brand j	LNA
Market position	$SHARE_{ik,t}$	Market share for firm i in category k	JD Power
Pioneer	$LEADINNI_{ijk,t}$	Pioneering innovation vs catching up innovation for brand j in category k	JD Power
APEAL/Performance, Execution and Layout	$APEAL_{ijk,t}$	APEAL rating for brand j in category k	JD Power
Initial Quality	$IQS_{ijk,t}$	Initial quality rating for brand j in category k	JD Power

Table 7**Impact of product introduction and rebates on firm value***

	<i>New-product introductions</i>		<i>Sales promotions</i>	
	Short-term	Long-term	Short-term	Long-term
SUV	56%	79%	53%	38%
Minivan	53%	88%	54%	31%
Premium midsize	48%	74%	58%	37%
Premium compact	75%	73%	76%	49%
Compact pickup	65%	79%	83%	36%
Full-size pick up	62%	75%	78%	56%

Table 8 Impact of product introduction and rebates on relative-to-competition firm value*

	<i>New-product introductions</i>		<i>Sales promotions</i>	
	Short-term	Long-term	Short-term	Long-term
SUV	60%	62%	52%	48%
Minivan	56%	56%	48%	48%
Premium midsize	41%	59%	59%	56%
Premium compact	64%	59%	67%	54%
Compact pickup	72%	67%	83%	61%
Full-size pick up	61%	83%	50%	78%

Table 9 **Moderating role of brand, market and firm characteristics on relative-to competition firm value elasticities (standard errors in parentheses)**

<i>Promotional Impact Drivers</i>	<i>New product introduction elasticities</i>		<i>Sales promotions elasticities</i>	
	<i>Standardized beta</i>	<i>t-value</i>	<i>Standardized beta</i>	<i>t-value</i>
<i>Market characteristics</i>				
Concentration	-0.276	-2.69***	0.070	0.60
Market size	-0.072	-0.71	-0.028	-0.25
Category growth rate	0.243	2.37***	-0.195	-1.76*
<i>Brand and Firm characteristics</i>				
Brand advertising	0.206	2.01**	0.093	0.84
Firm's share of category	-0.256	-2.50***	-0.130	-1.18
Brand's perceived appeal	-0.052	-0.51	-0.024	-0.22
Brand's perceived quality	0.010	0.05	-0.080	-0.72
Pioneering innovation	0.189	1.99**	0.081	0.73
<i>Manufacturers</i>				
Chrysler	0.158	1.54	0.020	0.18
Ford	0.144	1.40	-0.066	-0.60
GM	0.232	2.26**	-0.037	-0.33
Honda	0.091	0.89	-0.064	-0.58
Toyota	0.269	2.62***	-0.097	-0.88

We included dummy variables for each category and time window; these were not statistically significant

*** = $p < 0.01$

** = $p < 0.05$

* = $p < 0.10$

Table 10 Summary of hypotheses and empirical results

	<i>Hypotheses</i>	<i>Finding</i>
H1	Market size increases the new product performance impact on firm value	No
H2	Market growth rate increases the new product performance impact on firm value	Yes
H3	Concentration decreases the new product performance impact on firm value	Yes
H4	Pioneering innovations increase the new product performance impact on firm value	Yes
H5	Perceived quality and appeal increase the new product performance impact on firm value	No
H6	Investments in brand advertising increase the new product performance impact on firm value	Yes
H7	Market dominance decreases the new product performance impact on firm value	Yes

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Endnotes

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- ¹ Precisely, the uncertainty associated with product innovation, may result in a mismatch between expectations and market outcomes when the product is actually introduced. In those cases, firms may resort to promotions, such as price discounting, to close gaps between supply and demand.
 - ² Other measures of firm value include return on assets, return on sales and return on equity. However, these measures focus on the short term, they are not risk-adjusted and their typical level of temporal aggregation makes it harder to make the link to specific new-product introductions. Furthermore, since accounting measures are based on historical data, they do not adequately reflect future expected revenue streams (Kalyanaram, Robinson and Urban 1995).
 - ³ Following Pauwels et al. (2004), we define brand as what is typically known as “nameplates” in the auto industry. For example, Chevrolet, GMC and Cadillac are three General Motors brands in the SUV category.
 - ⁴ The practice in the auto industry is to set regular prices on an annual basis. Promotions are used tactically to adjust the “net price” offered to consumers according to market conditions. Hence, we account for price endogeneity by including promotions as an endogenous variable in the VARX model.
 - ⁵ The advertising data available to the study was annual manufacturer advertising from LNA. This advertising is aimed at strategic “brand building” rather than weekly, tactical responses to market conditions. Hence, we include this advertising variable as a moderator in the second-stage analysis, rather than as an endogenous variable in the VARX model estimated at the weekly level.
 - ⁶ While inclusion of the transportation index appears more relevant than the construction index, the big six car manufacturers account for much of the variation in this index, which could cause an endogeneity bias. We performed a sensitivity analysis with the transportation index and found similar results.
 - ⁷ As stated earlier, we investigate only the launch of new or updated products (which may incorporate process innovations), not process innovations by themselves.
 - ⁸ For example, if Toyota offers two redesigned SUV models in a particular week, with innovation levels 1 and 3, the new-product introduction variable takes on the value of 3 for the Toyota brand in the SUV category in that week.
 - ⁹ Detailed results are available from the first author upon request.
 - ¹⁰ We follow Pauwels et al. (2002) in adopting static weights (i.e. average share across the sample) to compute the weighted prices, rather than dynamic (current-period) weights.
 - ¹¹ Based on personal conversations with several automobile manufacturer executives.
 - ¹² To examine potential multicollinearity, the pair-wise correlations for all of the variables were examined, these range from |0.07| to |0.34| indicating that multicollinearity among the independent variables is not likely to be an issue.
 - ¹³ See 5.1 for caveats on the interpretation of promotion results.