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New Products, Sales Promotions, and Firm Value: The Case of the Automobile Industry

Year after year, managers strive to improve financial performance and firm value through marketing actions such as new product introductions and promotional incentives. This study investigates the short- and long-term impact of such marketing actions on financial metrics, including top-line, bottom-line, and stock market performance. The authors apply multivariate time-series models to the automobile industry, in which both new product introductions and promotional incentives are considered important performance drivers. Notably, whereas both marketing actions increase top-line firm performance, their long-term effects strongly differ for the bottom line. First, new product introductions increase long-term financial performance and firm value, but promotions do not. Second, investor reaction to new product introduction grows over time, indicating that useful information unfolds in the first two months after product launch. Third, product entry in a new market yields the highest top-line, bottom-line, and stock market benefits. Managers may use these results to justify new product efforts and to weigh short- and long-term consequences of promotional incentives.

For most firms, successful new products are engines of growth (Cohen, Eliashberg, and Ho 1997). Several frameworks, including the product life cycle and the growth–share matrix, postulate the need for new products that generate future profitability and prevent the obsolescence of the firm's product line (Chaney, Devinney, and Winer 1991; Cooper 1984). Indeed, Arthur D. Little consultants conclude from a *Fortune* poll that innovative companies achieve the highest shareholder returns (Jonash and Sommerlatte 1999). At the same time, the new product failure rate is high (ranging from 33% to greater than 60%) and has not improved in the past few decades (Boulding, Morgan, and Staelin 1997; McMath and Forbes 1998; Wind 1982). Moreover, even commercially successful new products may not benefit a firm financially because of high development and launch costs and quick imitation by competitors (e.g., Bayus, Jain, and Rao 1997; Chaney, Devinney, and Winer 1991).

In contrast, sales promotions are effective demand boosters that do not incur the risks associated with new products (Blattberg and Neslin 1990). Sales promotions are relatively easy to implement and tend to have immediate and substantial effects on sales volumes (Hanssens, Parsons, and Schultz 2001, Chap. 8). Consequently, the relative share of promotions in firms' marketing budgets continues to increase (Currim and Schneider 1991). However, sales promotions rarely have persistent effects on sales, which tend to return to prepromotion levels after a few weeks or months (Dekimpe, Hanssens, and Silva-Risso 1999; Nijs et al. 2001; Pauwels, Hanssens, and Siddarth 2002; Srinivasan, Leszczyc, and Bass 2000). Consequently, promotions' effectiveness in stimulating long-term growth and profitability for the promoted brand is in doubt (Kopalle, Mela, and Marsh 1999).

What are the long-term financial consequences, if any, of these two distinct marketing actions? This is an important question raised by many chief executive officers (CEOs) and chief financial officers (Marketing Science Institute 2002). It is also a difficult question because there are several metrics of financial performance, including revenue (top-line performance), profit (bottom-line performance), and firm value (performance in investor markets). In addition, it is difficult to distinguish between the short- and long-term effects of marketing actions.

Research in this area has focused mainly on the revenue and profit effects of new products, such as demonstrating their benefits in the personal computer industry (Bayus, Erickson, and Jacobson 2003). In terms of investor impact, it is known that new product announcements generate small

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excess stock market returns for a few days (Chaney, Devinney, and Winer 1991; Eddy and Saunders 1980) and that additional excess returns can be created when the new product is launched in the market (Kelm, Narayanan, and Pinches 1995). As for sales promotions, their effect on revenues is typically positive, albeit short-lived (Srinivasan et al. 2004), whereas their profit impact is often negative (Abraham and Lodish 1990). It is not known whether investors react to firms' promotion strategies, nor is it known how such a reaction, if present, compares with the effects of new product introductions.

In this study, we compare the effects of new product introductions and sales promotions on the firm's top-line, bottom-line, and investor performance. We choose the automobile industry for our focus because of its economic importance and its reliance on both new product introductions and sales promotions. Indeed, the automobile business represents more than 3% of the U.S. gross domestic product (J.D. Power and Associates [JDPA] 2002a) and accounts for one of seven jobs in the U.S. domestic economy (Tardiff 1998). Ever since consumers became interested in car styling in the 1920s, manufacturers have invested in innovation in the form of product-line changes (Farr 2000; Menge 1962). However, the costs of such styling changes can be substantial, from up to $100 million in the late 1950s to $4 billion in recent years (Sherman and Hoffer 1971; White 2001). Moreover, the success of styling changes is far from certain, even with extensive marketing research, because product development begins several years before the public launch (Farr 2000).

Research has shown that, overall, styling changes tend to increase sales but often do not pay off financially (Hoffer and Reilly 1984; Sherman and Hoffer 1971). However, these conclusions do not consider entry into new categories (e.g., sport-utility vehicles [SUVs]), nor do they account for potential long-term benefits to top-line performance (e.g., from repeat purchases or replacement sales), bottom-line performance (e.g., from spreading development costs over multiple vehicles), or firm value (e.g., from spillover benefits of successful new products to the manufacturer's image).

Car manufacturers (especially the "big three" U.S. companies) increasingly use sales promotions as incentives to boost sales and to optimize capacity use in a tough market environment (*BusinessWeek* 2002). However, concerns about the long-term profitability of such actions persist (*The Wall Street Journal* 2003). Recently, Chrysler's CEO, Dieter Zetsche, told the *Financial Times* that his forecasted sales gain of one million cars in the following five to ten years "[would] be driven by 12 new product introductions in the next three years rather than by low pricing" (JDPA 2002b, p. 1).

The remainder of this article is organized as follows: We first examine how new products and promotions affect financial performance and valuation over time, and we specify a comprehensive model to quantify the relationships. Next, we discuss the marketing and financial data sources and estimate the models. We then formulate conclusions, cross-validate the empirical results, and discuss their strategic implications for marketing.

Research Framework and Methodology

We begin by considering how new product introductions and promotional incentives influence top-line (firm revenue), bottom-line (firm income), and stock market (firm value) performance. We formulate requirements for a model that aims to capture the long-term effects of such marketing actions on the performance variables. Finally, we show how a vector-autoregressive (VAR) model satisfies the requirements, and we detail the empirical estimation steps.

Short- and Long-Term Performance Effects of Marketing

The top-line performance of new products has been studied extensively in the diffusion-of-innovation literature (e.g., Mahajan and Wind 1991). Among the major findings are that revenue from new products may take considerable time to materialize and that revenue levels depend on several factors, including the degree of product innovation. In addition, new product introductions may have a persistent effect on revenues, compared with the effects of price promotions, which typically produce only temporary benefits (Nijs et al. 2001; Pauwels, Hanssens, and Siddarth 2002; Srinivasan, Leszczyc, and Bass 2000). Therefore, the assessment of new product and promotional effects on revenue should distinguish short-term (immediate or same-week) effects and long-term effects, which can be temporary (adjustment, dust settling) or persistent (permanent).[1]

Bottom-line financial performance may benefit from new product introductions through increased demand, increased profit margin, and lower customer acquisition and retention costs (Bayus, Erickson, and Jacobson 2003). Geroski, Machin, and Van Reenen (1993) note that a new product can have a temporary effect on a firm's financial position because of the specific product innovation, or it can have a permanent effect because it transforms competitive capabilities. However, several factors can jeopardize such long-term profit benefits, even when top-line performance increases (Sherman and Hoffer 1971). Development and production costs are considerable, notably in the automobile industry, in which new-car platforms cost more than $1 billion (*The Wall Street Journal* 2002b). New product launches consume considerable marketing resources, especially for a major innovation. Similarly, the profitability of promotional incentives is far from certain (Abraham and Lodish 1990; Srinivasan et al. 2004).

The firm valuation (stock price) implications of marketing activities have not received much research attention to date. In general, it is known from the efficient-market hypothesis that stock prices follow random walks: The current price reveals all the known information about the firm's future earnings prospects, and shocks (surprises) that alter earnings expectations are incorporated immediately (Fama and French 1992). Therefore, the stock market may not react to new product introductions because a firm's current valuation already incorporates the launch, either because it was preannounced or leaked or because the company is known to be an innovator and is expected to produce a steady flow of new products. Instead, the stock market reacts to the extent that the new product introduction updates the forecasts of the firm's future returns (Ittner and Larcker 1997). If investors consider the new product introduction favorably (i.e., expectations are exceeded), the stock price will increase to reflect the expected net sum of future discounted cash flows that result from the new product (Wittink, Ryans, and Burus 1982, p. 3).

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[1] Persistent (permanent) effects are defined as the difference between baseline performance before the marketing action and baseline performance after the action's effects have stabilized. For a detailed explanation of the time frame distinctions, see Pauwels, Hanssens, and Siddarth (2002).

However, the efficient-market perspective also acknowledges that investors do not always correctly and immediately forecast the firm's future returns (e.g., Ball and Brown 1968). Although investors have expectations of the firm's general capability in new product introductions, the market success of any specific introduction is usually in doubt (*The Wall Street Journal* 2002a; Wittink, Ryans, and Burus 1982). Specifically, investors need to assess two major uncertainties correctly: the probability of new product success and the level of profits associated with the product (Chaney, Devinney, and Winer 1991). On the one hand, the stock market may overreact to a product introduction that eventually does not become a financial success (Chaney, Devinney, and Winer 1991). On the other hand, investors may underreact as they focus on current rather than future revenue streams (Michaely, Thaler, and Womack 1995). Therefore, investors should not be expected to be fully able to predict the total financial effects over time of new product introductions at the time of launch. Instead, investors update their evaluation of introductions over time. Helpful information is contained in early success measures such as low "days-to-turn" and high initial satisfaction ratings, which indicate high product popularity in the target market and the absence of major technical problems. Therefore, the short-term investor reaction may adjust over time until it stabilizes in the long run as the new product's performance becomes so predictable that it loses its ability to adjust stock prices further.

A similar argument can be developed with respect to promotion effects on valuation. Given the positive revenue effects of promotions for manufacturers, some positive investor reaction can be expected in the short run. However, because promotion effects on sales are typically short lived, it is not evident a priori whether the positive investor reaction will persist, dissipate, or turn around.

Finally, we recognize that dynamic feedback loops may exist among marketing variables, among performance variables, and between marketing and performance variables. Marketing actions such as new product introductions and promotional incentives often become associated with one another over time (Dekimpe and Hanssens 1999; Pauwels 2004). Successful new product introductions can increase a brand's price premium and make promotions redundant. In contrast, a prolonged absence of successful new product introduction may force a company to use promotional incentives to "move product" (*The Wall Street Journal* 2002a). Similarly, revenue performance may act as an intermediate variable between marketing actions and firm value. For example, successful new products lead to higher revenues and profits, which in turn can be used to launch other new products (Kashani 2003). Likewise, lackluster revenue performance may prompt some companies to engage in aggressive rebate tactics in an effort to boost sales (*USA Today* 2002).

Model Requirements

On the basis of these considerations, we maintain four criteria for our model of dynamic interactions among marketing and performance variables. First, the model should provide a flexible treatment of both short- and long-term effects (Dekimpe and Hanssens 1995). Second, the model should be robust to deviations from stationarity, particularly the presence of random walks in stock prices, which can lead to spurious regression problems (Granger and Newbold 1986).[2] Third, the model should provide a forecast and expected baseline for each performance variable, so that we can capture the impact of unexpected events as deviations from the baseline. Both econometric models and survey methods have been shown to perform well in generating these expectations (Cheng, Hopwood, and McKeown 1992; Fried and Givoly 1982). Consequently, our model uses forecasts based on an econometric model and controls for changes in analyst earnings expectations. Fourth, the model should allow for various dynamic feedback loops between marketing and business performance variables.

In summary, the study of the longitudinal impact of new product introductions and promotional incentives requires a carefully designed system of equations that accounts both for the time-series properties of performance and marketing variables and for their dynamic interactions.

VAR Model Specification

We used VAR models, which are well suited for measuring the dynamic performance response and interactions between performance and marketing variables (Dekimpe and Hanssens 1999). Both performance variables and marketing actions are endogenous (i.e., they are explained by their own past and by the past of the other endogenous variables). Specifically, VAR models not only measure direct (immediate and lagged) response to marketing actions but also capture the performance implications of complex feedback loops. For example, a successful introduction generates higher revenue, which may prompt the manufacturer to reduce sales promotions in subsequent periods. The combination of increased sales and higher margins may improve earnings and stock price and thus further enhance the effectiveness of the initial product introduction over time. Because of such chains of events, the full performance implications of the initial product introduction may extend well beyond the immediate effects.

Depending on the order of integration of the data, VAR models are specified in levels or changes. Our unit-root tests (Enders 1995) reveal evolution in performance variables but stationarity for new product introductions and sales promotions.[3] Consequently, the VAR model for each brand j in category k from firm i is specified as follows:

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[2] Stationary variables fluctuate as temporary deviations around a fixed mean or trend. Evolving variables, such as random walks, have a unit root (i.e., they fluctuate without reverting to a fixed mean or trend). For technical definitions and applications in marketing, see, for example, Dekimpe and Hanssens (1995).

$$(1)\quad \begin{bmatrix}\Delta \mathrm{VBR}_{i,t}\\ \Delta \mathrm{INC}_{i,t}\\ \Delta \mathrm{REV}_{i,t}\\ \mathrm{NPI}_{ijk,t}\\ \mathrm{SPR}_{ijk,t}\end{bmatrix} = C + \sum_{n=1}^{N} B_n \begin{bmatrix}\Delta \mathrm{VBR}_{i,t-n}\\ \Delta \mathrm{INC}_{i,t-n}\\ \Delta \mathrm{REV}_{i,t-n}\\ \mathrm{NPI}_{ijk,t-n}\\ \mathrm{SPR}_{ijk,t-n}\end{bmatrix}$$

$$+ \Gamma \begin{bmatrix}\Delta \mathrm{S\&P500}_{t}\\ \Delta \mathrm{Construct}_{t}\\ \Delta \mathrm{Exchange}_{t}\\ \Delta \mathrm{EPS}_{i,t}\end{bmatrix} + \begin{bmatrix}u_{\mathrm{VBR}i,t}\\ u_{\mathrm{INC}i,t}\\ u_{\mathrm{REV}i,t}\\ u_{\mathrm{NPI}ijk,t}\\ u_{\mathrm{SPR}ijk,t}\end{bmatrix},$$

with B_n, Γ vectors of coefficients, $[u_{\mathrm{VBR}i,t}, u_{\mathrm{INC}i,t}, u_{\mathrm{REV}i,t}, u_{\mathrm{NPI}ijk,t}, u_{\mathrm{SPR}ijk,t}]' \sim N(0, \Sigma_u)$, N as the order of the VAR system based on Schwartz's Bayesian information criterion (SBIC), and all variables expressed in logarithms or their changes (Δ). In this system of equations, the first equation explains changes to firm value, which we operationalize as the ratio of the firm's market value to book value (VBR) (Miller and Modigliani 1961).[4] This variable reflects a firm's potential growth opportunities and is frequently used to assess 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 (INC) and top-line (REV) financial performance of firm i. The fourth and fifth equations model firm i's marketing actions, that is, new product introductions (NPI) and sales promotions (SPR) for brand j in product category k.

With respect to the exogenous variables in this dynamic system, we control for seasonal demand variations in vector C (Labor Day weekend, Memorial Day weekend, and the end of each quarter) and for fluctuations in the overall economic and investment climate (Standard and Poor's [S&P] 500 index, construction cost index, and dollar–yen exchange rate).[5] Finally, we account for the impact of stock market analysts' expectations of earnings per share (EPS) (Ittner and Larcker 1997).

Note that the VAR-forecast baseline of market-to-book ratio includes changes to the S&P 500 index, which is the sole predictor of a firm's stock price in the market model used by event studies to calculate excess returns (Chaney, Devinney, and Winer 1991; Eddy and Saunders 1980). In contrast, our model develops a more refined forecast baseline, which also includes changes to the construction cost index and to firm-specific earnings forecasts and financial performance. An argument could be made for an even more extensive VAR model specification (e.g., simultaneous inclusion of competitive product-introduction and promotion variables). However, we want to avoid overparameterization effects on our estimates (Abadir, Hardi, and Tzavalis 1999; Pesaran and Smith 1998), and we aim to balance completeness and parsimony. Permanent effects in the VAR models are possible whenever performance variables are evolving, and SBIC implies lag lengths that balance model fit and complexity.

Vector-autoregressive models have been used extensively in both the marketing and the finance literature. For example, they are used to assess the short- and long-term performance effects of marketing activities such as advertising, distribution, nonprice and price promotions, store-brand entry, and product-line extensions (Bronnenberg, Mahajan, and Vanhonacker 2000; Dekimpe and Hanssens 1999; Nijs et al. 2001; Pauwels 2004; Pauwels, Hanssens, and Siddarth 2002; Pauwels and Srinivasan 2004; Srinivasan et al. 2004). In the finance literature, VAR models have been used to study the relationships within and between stock markets (Eun and Shim 1989), the relationships between capital flows and equity returns (Froot and Donohue 2002), the impact over time of monetary policy on stock market returns (Thorbecke 1997), and the effect of credit interruptions on the economy (Mason, Anari, and Kolari 2000).

Long-Term Impact of Marketing Actions: Impulse-Response Functions

The VAR model estimates the baseline of each endogenous variable and forecasts its future values on the basis of the dynamic interactions of all jointly endogenous variables. Based on the VAR coefficients, impulse-response functions track the impact over time of unexpected changes (shocks) in the marketing variables on forecast deviations from the baseline for the other endogenous variables. This conceptualization closely reflects previous studies of market performance (e.g., Dekimpe and Hanssens 1999), financial performance (e.g., Srinivasan et al. 2004), and stock prices (e.g., Erickson and Jacobson 1992). As Mizik and Jacobson (2003, p. 21) argue, "when an unanticipated change in strategy occurs, the markets react and the new stock price reflects the long-term implications such change is expected to have on future cash flows."

To derive the impulse-response functions of a marketing action, we compute two forecasts, one based on an information set without the marketing action and the other based on an extended information set that accounts for the marketing action. The difference between the forecasts measures the incremental effect of the marketing action. This model feature is especially attractive in our investigation of stock market performance, because investors react to shocks, or deviations from their expectations. In the finance area, these expectations derive from econometric forecasting models based on the firm's financial performance records, and the shocks are the model forecast errors (e.g., Cheng and Chen 1997). The VAR model is a sophisticated version of such an econometric forecast. In addition, the dynamic effects are not restricted in time, sign, or magnitude a priori. We adopt the generalized, simultaneous-shock approach (Dekimpe and Hanssens 1999) in which we use the information in the residual variance–covariance matrix of the VAR model to derive a vector of *expected* instantaneous shock values. Because we estimate a model in logarithms, the short- and long-term performance impact estimates are elasticities (Nijs et al. 2001). Finally, we follow established practice in marketing research and assess the statistical significance of each impulse-response value by applying a one-standard error band (e.g., Nijs et al. 2001), as in the work of Pesaran, Pierse, and Lee (1993) and Sims and Zha (1999).

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[3] We also performed a cointegration test for the existence of a long-term equilibrium among the evolving variables. The test result was negative. Detailed results are available on request from the first author.

[4] Other measures of firm value include return on assets, return on sales, and return on equity. However, these measures focus on the short run, they are not risk adjusted, and their typical level of temporal aggregation makes it more difficult to link them to specific new product introductions. Furthermore, because accounting measures are based on historical data, they do not adequately reflect future expected revenue streams (Kalyanaram, Robinson, and Urban 1995).

[5] Although 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.

Relative Importance of Marketing Actions: Forecast-Error Variance Decomposition

Although impulse-response functions trace the effects of a marketing change on performance, forecast-error variance decomposition (FEVD) determines the extent to which the performance effects are due to changes in each of the VAR variables (Hamilton 1994). Thus, the variance decomposition of firm value provides information about the relative importance of previous firm value, bottom- and top-line performance, new product introductions, and promotions in determining deviations of firm value from baseline expectations. Of particular importance is the comparison of the short- and long-term FEVD. For example, this comparison may reveal that the initial movements in stock price are mainly due to promotion shocks but that, over time, the contribution of new product introductions gradually becomes stronger. Moreover, FEVD addresses the role of the intermediate performance metrics (revenue and profit). In our context, new product introductions may affect firm value only indirectly through top- and bottom-line performance (in which case, all firm value forecast deviations are attributable to the performance variables) or may have a direct effect beyond the performance impact. For example, in the marketing context, Hanssens (1998) uses FEVD on channel orders and consumer demand data to show that sudden spikes in channel orders have no long-term consequences for the manufacturer, *unless* movements in consumer demand accompany them. For a detailed overview of all VAR modeling steps, see the work of Enders (1995) and Dekimpe and Hanssens (1999).

Data Description

Our data come from four major sources: JDPA for weekly sales and marketing, Center for Research in Security Prices (CRSP) and COMPUSTAT for firm performance, and I/B/E/S for earnings forecasts (Ittner and Larcker 1997). We describe these databases in turn and summarize our variable operationalization and data sources in Table 1.

Marketing Databases: JDPA

Sales transaction data for a sample of dealerships in the major U.S. metropolitan areas are available from JDPA. We use data containing every new-car sales transaction of a sample of 1100 California dealerships from October 1996 through December 2001. The detailed data for this region are representative of other U.S. regions, for which available data periods are shorter. Each observation in the JDPA data contains the transaction date; manufacturer; model year; make; model; trim and other car information; transaction price; and sales promotions, which are operationalized as the monetary equivalent of all promotional incentives per vehicle. All observations are retail transactions (i.e., sales or leases to final consumers), excluding fleet sales.[6] Moreover, the data set is at the detailed "vehicle" level, which is 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); number of doors (e.g., two door, four door, four-door extended cabin); trim level (e.g., for Honda Accord, DX, EX, LX); drive train type (e.g., two-wheel drive, four-wheel drive); transmission type (e.g., automatic, manual); cylinders (e.g., four cylinder, V6); and displacement (e.g., 3.0 or 3.3 liters) (Morton, Zettelmeyer, and Silva-Risso 2001).

The vehicle information is aggregated to the brand level, which represents a company's presence in a certain category. For example, Chevrolet, GMC, and Cadillac are the three General Motors brands in the SUV category.

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

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). For example, the 2002 Toyota 4Runner with minor exterior styling changes is a Level 1 car, the 1999 Ford Explorer with minor updates to interior and exterior is a Level 2 car, the 1998 Isuzu Rodeo with a major change to vehicle platform is a Level 3 car, the 2001 Ford Explorer with a new platform and additional "third-row" seating is a Level 4 car, and the 2001 Acura MDX is a Level 5 car. We compared the JDPA classification with the scales used in previous automobile studies in the economics literature (Hoffer and Reilly 1982; Sherman and Hoffer 1971). Although all three approaches converge on most innovation levels, the JDPA scale is more informative in that it acknowledges the introduction of new consumer benefits and includes new brand entry (i.e., the first time a brand enters an automobile category). Furthermore, when there

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[6] A major source of fleet sales is vehicles sold to rental car companies, which are often affiliated with or owned by a car manufacturer. For this reason, the inclusion of fleet sales could contaminate our measures.

TABLE 1
Measures, Operationalization, and Data Sources

Measure	VAR Variable	Endogeneity	Operationalization	Temporal Aggregation	Data Sources
Firm value	$VBR_{i,t}$	Endogenous	The ratio of firm i's market value to book value (defined as market value to book equity)	Weekly	CRSP
Top-line performance	$REV_{i,t}$	Endogenous	The revenues of firm i	Weekly (quarterly data allocated in proportion to the retail sales level in each week)	COMPUSTAT JDPA transactions
Bottom-line performance	$INC_{i,t}$	Endogenous	The earnings of firm i	Weekly (quarterly data allocated in proportion to the retail sales level in each week)	COMPUSTAT JDPA transactions
Product innovation	$NPI_{ijk,t}$	Endogenous	The brand innovation variable, 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	Weekly	JDPA expert opinion JDPA transactions
Sales promotions	$SPR_{ijk,t}$	Endogenous	The monetary equivalent of all promotional incentives for brand j in category k in a particular week	Weekly	JDPA transactions
S&P 500	$S\&P500_t$	Exogenous	The S&P 500 index	Weekly	CRSP
Construction cost index	$CONSTRUCT_t$	Exogenous	The construction cost index	Weekly	CRSP
Earnings forecasts	$EPS_{i,t}$	Exogenous	Quarterly earnings forecasts for firm i	Quarterly	I/B/E/S
Dollar–yen exchange rate	$Exchange_t$	Exogenous	The dollar–yen exchange rate	Weekly	Federal Reserve Foreign Exchange

TABLE 2
JDPA Expert Rating Scale on Innovation Level for Car Model Changes

Innovation Scale	Innovation Level Description
0	No visible change
1	Only styling changes that affect grille, headlight, and taillight areas
2	Minor changes that affect sheet metal in front and rear quarter areas and minor changes to interior but not the instrument panel
3	Major changes that affect exterior sheet metal and considerable change to interior, including instrument panel
4	All new sheet metal including the roof panel (e.g., new platform, change from rear-wheel to front-wheel drive)
5	New entry into the market

are no visible changes between model years, the scale assigns an innovation value of zero.[7] The expert ratings operationalize our new product introduction variable, which is timed at the moment of market launch.

Because innovation is vehicle specific and we estimated our models by brand, the innovation variable needs to be converted to the brand level. We define brand-level innovation as the maximum innovation level for all the brand's vehicle changes in the entry week.[8] We consider 41 brands in six major product categories: SUVs, minivans, midsize sedans, compact cars, compact pickups, and full-size pickups. Table 3 shows that during the period of observation (October 1996 through December 2001), some of the categories experienced many major and minor new product introductions (SUVs and full-size pickups) or a dominance of major introductions (minivans). In other categories there was a more moderate amount of product innovation (midsize and compact cars), and still others were characterized mainly by minor product improvements (compact pickups).

Financial Databases: CRSP, COMPUSTAT, and I/B/E/S

Our measure of firm value is based on the comprehensive data set of firm market capitalization and daily market indexes (S&P 500) of the New York Stock Exchange, which we obtained from CRSP. The CRSP database covers stocks traded on the major U.S. stock exchanges: the New York Stock Exchange, the American Stock Exchange, and NASDAQ. Following financial convention, we used Friday closing prices to compute weekly firm market capitalization (Mizik and Jacobson 2003).

For firm-specific information and quarterly accounting information, such as book value, revenues, and net income, we used S&P's 1999 COMPUSTAT database. The quarterly variables of income and revenue are allocated to quarter weeks in proportion to the retail sales level generated in each week, as obtained from the JDPA database (i.e., we assume that revenue and income generated in a given week are proportional to unit sales in that week). In addition, the COMPUSTAT database provides monthly indexes of the construction cost index and the consumer price index, which we used to deflate all monetary variables. Finally, the I/B/E/S database provides analysts' quarterly earnings forecasts for the six major manufacturers in this study—Chrysler, Ford, General Motors, Honda, Nissan, and Toyota—which represent approximately 86% of the U.S. car market.

Recall that our unit of analysis for the marketing variables is the brand level in each of six product categories. Table 4 provides a listing of the brands in the study as well as the descriptive statistics for the measures that form the basis of our analysis. A casual inspection of Table 4 does not reveal any obvious association between the number of major and minor new product introductions and the ratio of market capitalization to book value. This relationship needs to be assessed longitudinally while controlling for exogenous factors that influence the general stock market and the specific industry, as in our VAR models.

TABLE 3
New Product Introductions in Six Car Categories

Category	Major Innovations (Levels 3–5)	Minor Innovations (Levels 1–2)	Total
SUV	88	51	139
Minivan	24	4	28
Midsize sedan	21	16	37
Small cars	23	22	55
Compact pickup	19	29	48
Full-size pickup	70	32	112
Total	245	154	399

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[7] As we stated previously, 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 at Levels 1 and 3, the new product introduction variable has the value of 3 for the Toyota brand in the SUV category in that week.

TABLE 4
Characteristics of the Six Leading Car Manufacturers (October 1996–December 2001)

	Chrysler[a]	Ford	General Motors	Honda	Nissan	Toyota
Characteristics	**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
U.S. market share	15%	21%	28%	8%	4%	10%
Market capitalization ($ in millions)	48,310	52,475	41,770	36,100	15,360	119,140
Market capitalization to book value	1.91	2.36	1.90	2.29	1.51	2.16
Quarterly firm earnings ($ in millions)	845	1612	988	559	–108	1079
Quarterly firm revenue ($ in millions)	29,120	39,520	43,355	12,792	13,065	26,780
Number of major introductions (Levels 3–5)	38	77	64	23	15	28
Number of minor introductions (Levels 1–2)	29	36	29	19	9	28
Sales promotions per vehicle ($)	633	382	632	24	200	113

[a] We included Chrysler's merger into Daimler-Chrysler (October 1998) in the Chrysler VAR model by including dummy variables (for a similar treatment of exogenous variables, see Nijs et al. 2001).

Results

The 41 estimated VAR models (one for each brand), with the number of lags indicated by the SBIC, showed good model fit (the R^2 ranges from .25 to .57, and the F-statistic ranges from 3.06 to 14.37).[9] We first review our results on the performance impact of new product introductions and sales promotions. We then discuss how the effects emerge over time, and we demonstrate the interactions between new product introductions and promotions. Finally, we examine the robustness of our findings across both categories and innovation levels.

Impact of New Product Introductions on Financial Performance and Firm Value

Table 5 shows short-term (same-week) and long-term elasticities of brand-level product introductions and promotions on firm-level performance as sales-weighted averages over all 41 brands for six categories and six companies.[10]

Because we relate total corporate performance to a new product introduction for one brand in one category, the reported elasticities are small, which is in line with previous research (Kelm, Narayanan, and Pinches 1995) but statistically significant. Overall, new product introductions have a positive short- and long-term impact on the firm's top-line, bottom-line, and stock market performance. Moreover, the impact persists over time.

First, our firm revenue results confirm previous findings of strong sales effects of new product introductions, both in the car industry (Hoffer and Reilly 1984; Sherman and Hoffer 1971) and in other categories (e.g., Booz Allen Hamilton 1982; Kashani, Miller, and Clayton 2000). Notably, we find that the top-line benefits materialize relatively quickly, in six to ten weeks, possibly because the automobile industry is product driven and its end users are highly involved in the category (Farr 2000; JDPA 2002).

Second, the bottom-line impact of new product introductions follows a similar pattern over time as the top-line impact but with lower elasticities. This demonstrates the crucial importance of new product introduction costs in the industry. This observation is consistent with Bayus and Putsis's (1999) research on product proliferation in the personal computer industry and thus may generalize to other industries with substantial innovation costs.

Third, the average short-term firm value impact of new product introductions is low compared with the top- and bottom-line benefits. An explanation for this finding is that

TABLE 5
Impact of Product Introduction and Rebates on Performance and Firm Value (Mean Values)

	New Product Introductions		Sales Promotions	
	Short Run	**Long Run**	**Short Run**	**Long Run**
Top-Line Performance				
Firm revenue	2.39	4.30	1.48	7.94
Bottom-Line Performance				
Firm income	.37	.60	1.09	–1.28
Firm Value				
Ratio of market capitalization to book value	.02	1.14	.12	–.78

Notes: For readability, we multiplied elasticity estimates by 1000.

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[9] Detailed results are available on request from the first author.

[10] We follow Pauwels, Hanssens, and Siddarth (2002) in adopting static weights (i.e., average share across the sample) rather than dynamic (current-period) weights to compute the weighted prices.

investors have already incorporated the firm's product introduction into their valuation (e.g., Ittner and Larcker 1997). In contrast, the long-term firm value effects are typically higher, indicating that relevant new information unfolds as time progresses. Figure 1 illustrates the impact over time of new product introductions for the Honda Odyssey (minivan category) on the valuation of the Honda corporation. After a small initial (short-term) gain, the effect grows and stabilizes at its persistent (long-term) positive value in approximately two months.

Impact of Sales Promotions on Financial Performance and Firm Value

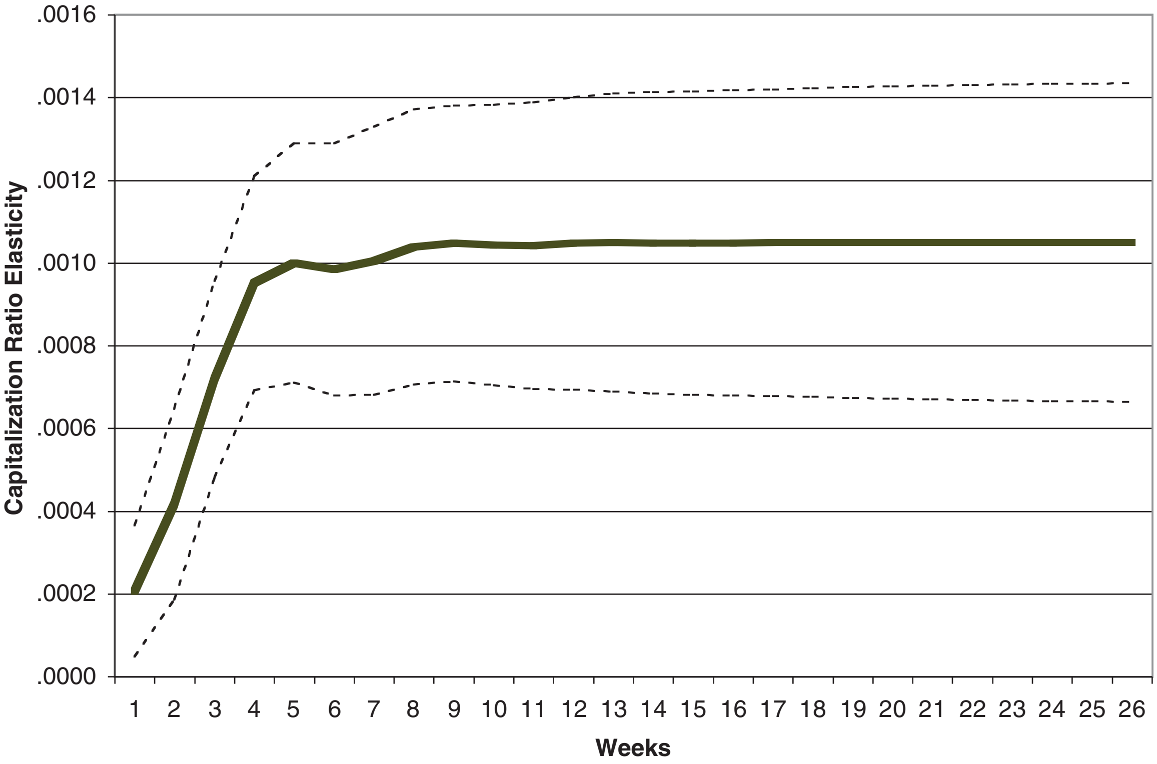
The effects of promotional programs on market and financial performance are significantly different from those of new product introductions. Table 5 shows that incentive programs have uniformly positive effects in the short run; top-line, bottom-line, and stock market performance all increase. In other words, investors' reaction mirrors consumers' reaction to incentive programs, which is strong, immediate, and positive (Blattberg, Briesch, and Fox 1995). However, the beneficial effects are short-lived for all but a firm's top-line performance, because both long-term bottom-line and firm value elasticities are negative. As we detailed in the validation analysis, this negative long-term elasticity represents most brands in our analysis.

A possible explanation for the sign switch in income and investor reaction between the short and long run is price inertia or habit formation in sales promotions: The short-term success of promotions makes it attractive for managers to continue using them (Krishna, Mela, and Urbany 2001; Srinivasan, Pauwels, and Nijs 2003). In addition, because promotions are known to stimulate consumer demand only temporarily (Srinivasan et al. 2004), they need to be repeated, lest the company is willing to sacrifice top-line performance. Although such repetitive use of incentives is able to maintain, and even grow, the initial revenue effects (which drives the positive long-term revenue elasticity), profit margins erode and bottom-line performance and firm value suffer in the long run (*The Wall Street Journal* 2002c). This dynamic behavior is the opposite of the positive feedback loop, or "virtuous cycle," for new product introductions for which positive consumer and investor reaction stimulate further new product introduction efforts (Kashani, Miller, and Clayton 2000).

Growing Importance of New Product Introductions for Firm Value

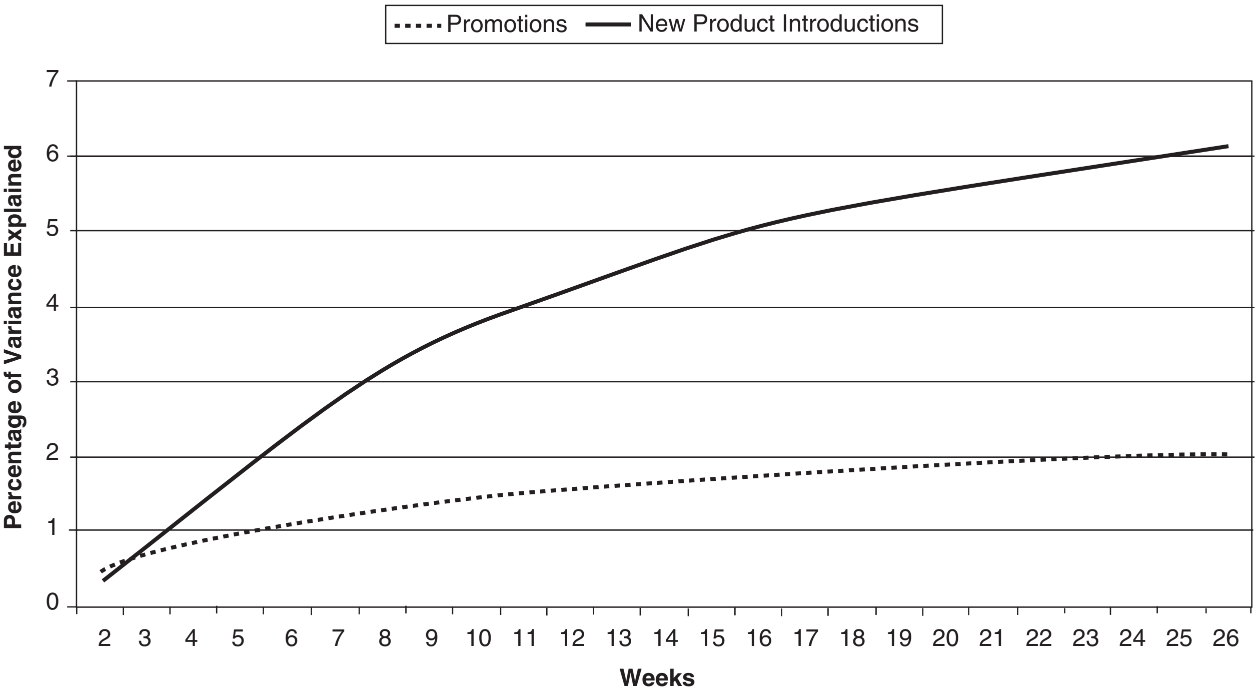
Because we find the firm value effects of new product introductions and promotions intriguing, we further investigate their importance in explaining firm value beyond their bottom-line effects. Figure 2 shows the FEVD results of

FIGURE 1
Elasticity over Time of Odyssey Introductions on Honda's Market-to-Book Ratio



Notes: We computed the market-to-book ratio as the impulse response of the log of the marketing variable to the log of the performance variable.

FIGURE 2
Market Capitalization FEVD



Notes: Previous market-to-book ratio, income, and revenue account for the remaining variance.

firm value, accounting for all performance and marketing variables.

Although sales promotions initially are more important, an increasing percentage of the forecast deviation variance in firm value is attributed to new product introductions. On average, the ability of product introduction to explain firm value forecast deviations is eight times greater after two quarters than it is in the week of product launch.

Together with the increasing elasticity findings that are illustrated in Figure 1, this result pattern implies that new product introduction per se is a fairly high-entropy signal to investors: Although investors' immediate reactions are not strong, they gradually adjust their reactions as emerging consumer acceptance information helps them update their expectations (Kelm, Narayanan, and Pinches 1995).[11] Moreover, the demonstrated direct effect of new product introductions on firm value implies that investors consider more than only current bottom-line effects. In other words, investors reward firm innovativeness in the form of a premium in firm valuation beyond the new product's impact on top- and bottom-line performance. This finding implies that investors show foresight beyond the extrapolation of firm profits. For example, they may reward the spillover benefits of successful introductions on the manufacturer's image and reputation (Sherman and Hoffer 1971), possibly expecting that the image will enhance consumers' acceptance of the firm's future new product introductions.

Interactions Between New Product Introductions and Promotional Incentives

Because new product introductions and promotional incentives have such different long-term effects on firm value, we investigate their interaction in firms' decision making. We capture the dynamic interactions by examining the impulse response of promotional incentives to new product introductions (see Table 6).

TABLE 6
Number of Brands with Negative Interactions Between Marketing Actions

	Short Run	Long Run
SUV	58%	58%
Minivan	67%	75%
Premium midsize	50%	75%
Premium compact	36%	78%
Compact pickup	20%	60%
Full-size pickup	62%	75%

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[11] The emerging consumer acceptance information about the new product could include factors such as vehicle sales, days-to-turn, product reviews, advertising efforts, and consumer awareness. The determination of the exact nature of this information is beyond the scope of this study.

Notably, new product introductions have a negative and persistent impact on the use of incentives. Because sales promotions are long-term value deterrents (per our previous finding), this finding supports the important strategic conclusion that a policy of aggressive new product introductions is an antidote for excessive reliance on consumer incentives. For example, consider the major redesign of the Honda Odyssey in 1999: The new design had a persistent, beneficial effect on the margins for the vehicle, which continues to enjoy strong sales without virtually any promotional incentives (White 2001).

Robustness of Results Across Product Categories and Innovation Levels

Finally, we assess the robustness of our findings across product categories and innovation levels. First, are the short- and long-term firm value effects of new product introductions and promotional incentives robust across product categories? Table 7 shows the frequency of positive stock market performance effects of new product introductions for the 41 brands in our analysis.

The short-term firm value effects show both negative and positive values across categories, in support of our interpretation that new product introductions are high-entropy signals to investors. Still, the short-term effects of new product introductions are positive for the most part; no product category shows a dominance of negative effects. The long-term 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-term impact on market capitalization for 81% of all brands.

The short-term effects of promotion incentives vary among categories: SUVs, minivans, and premium midsize cars show a negative impact, and premium compact cars, compact pickups, and full-size pickups show a positive impact. Overall, half of all brands show positive short-term promotion effects. In the long run, this is true for only 43% of the brands.

Second, does the general pattern of our findings hold across innovation levels? To answer this question, we reestimate our model for each brand and substitute the introduction variable by variables that measure each innovation level.[12] Table 8 shows the detailed breakdown of the performance impact of styling changes only (Level 1), minor sheet-metal changes (Level 2), major sheet-metal changes (Level 3), all new sheet metal and/or new platform (Level 4), and new market entry (Level 5).

Consistent with the new product literature (Cooper and Kleinschmidt 1993; Holak and Lehmann 1990; Montoya-Weiss and Calantone 1994), we observe an almost linear relationship between the innovation level and its short-term revenue impact. Long-term revenue performance follows a similar pattern, with low impact for mere trim changes and high impact for new market entries; however, there is little difference among the intermediate innovation levels.

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[12] Because our innovation variables are not continuous, we validate our VAR results by estimating ordered probit models for the five-point innovation scale and probit models for the five innovation-level dummy variables. Comparison of the probit coefficients with the VAR innovation equations yields high correlations (.78 for the major/minor innovation models and .87 for the five-point innovation scale models). We conclude that our main results are robust to the nature of the innovation scale.

TABLE 7
Percentage of Brands with Positive Firm Value Elasticity

	New Product Introduction		Promotional Incentives	
Category	**Short Run**	**Long Run**	**Short Run**	**Long Run**
SUV	58%	92%	42%	50%
Minivan	67%	100%	17%	17%
Premium midsize	67%	83%	17%	17%
Premium compact	71%	57%	86%	57%
Compact pickup	80%	80%	60%	40%
Full-size pickup	50%	75%	75%	75%
Average	66%	81%	50%	43%

TABLE 8
Performance Impact of Introduction Levels (Mean)

New Product Introductions	Level 1	Level 2	Level 3	Level 4	Level 5
Revenue short-term impact	2.47	3.04	3.27	4.67	6.02
Revenue long-term impact	2.32	6.83	5.65	5.68	10.45
Income short-term impact	.70	.38	.35	.88	2.09
Income long-term impact	.41	2.61	–.40	–4.99	.69
Firm value short-term impact	–.01	1.27	–.45	–1.06	1.19
Firm value long-term impact	1.84	1.53	.87	–2.31	3.46

Notes: For readability, we multiplied elasticity estimates by 1000.

The results for bottom-line performance are more complex. The short-term impact on income has a U-shaped relationship with innovation level: Partial sheet-metal changes (Levels 2 and 3) have a lower income impact than mere styling changes, whereas major updates and especially new brand entries yield the greatest income benefits. In the long run, we even observe negative average income effects for Levels 3 and 4. The results reflect and extend previous findings of negative financial returns on new-car models (Sherman and Hoffer 1971) and demonstrate the crucial importance of new product introduction costs in the auto industry.

Finally, the stock market performance impact has a similar U-shaped relationship with innovation level, but there is a preference for new market entries over minor updates. The results again support our interpretation that investors consider more than only current financial returns, such as spillover innovation benefits in the more distant future, which may include a manufacturer's improved image, increased revenues from the opening of new markets, and reduced costs from applying the innovation technology to different vehicles in the fleet (Sherman and Hoffer 1971). Indeed, Booz Allen Hamilton (1982) argues that new-to-the-world products and new product lines (Level 5) offer the highest benefit potential but face manager reluctance because they also pose a major risk compared with incremental innovations. Therefore, investors appear to appreciate new market entries as a signal of confident and bold management.

Implications

Our central result is that beyond the impact of the firm's earnings and the general investment climate, product introductions have positive and increasing effects on firm value. In contrast, sales promotions diminish long-term firm value, even though they have positive effects on revenues and (in the short run) on profits. Thus, the investor community rewards new product introductions and punishes discounting beyond the readily observable financial performance of the firm. Table 9 summarizes these findings.

Are the reported elasticities economically relevant? Table 10 reports the size of the monetary effects on market capitalization in dollars.[13] New product introductions typically generate tens of millions of dollars of long-term firm value, and often several hundred million dollars (up to $302 million). The reverse is true for promotions, which subtract tens or even hundreds of millions of dollars of firm value, or up to $324 million in our calculations. These amounts are especially great given that both product introduction and

TABLE 9
Summary of Findings

Impact of ...	Short Run	Long Run
New product Introductions on top-line performance	+	++
New product Introductions on bottom-line performance	+	++
New product Introductions on firm value	+	++
Promotions on top-line performance	+	++
Promotions on bottom-line performance	+	–
Promotions on firm value	+	–
New product introductions on the use of promotions	–	–

Notes: + = significant, positive impact; – = significant, negative impact; ++ = intensified positive impact.

TABLE 10
Monetary Impact of New Product Introductions and Rebates on Firm Value

	Chrysler	Ford	GM	Honda	Nissan	Toyota
New Product Introductions						
SUV	302	65	49	102	201	200
Minivan	36	34	36	32	2	184
Midsize sedan	34	10	132	7	4	154
Small cars	115	30	59	60	–29	73
Compact pickup	17	58	138	—	32	25
Full-size pickup	47	41	13	—	—	259
Rebates						
SUV	–148	–26	–72	–36	–39	–92
Minivan	–200	–64	–67	–37	–44	–24
Midsize sedan	–45	–324	–32	–25	–7	–91
Small cars	–64	–58	–24	35	28	37
Compact pickup	–65	–43	–93	—	32	61
Full-size pickup	–157	–20	–76	—	—	–35

Notes: Median impact is in millions of dollars.

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[13] We derive the dollar metric of incremental impact on market capitalization using the estimated elasticities and the end-of-the-observation-period values of the brand's marketing variables (innovation level and rebate) and ratio of market capitalization to book value (Dekimpe and Hanssens 1999, Note 11).

sales promotions are not isolated events in the auto industry. They occur relatively frequently and, as such, can account for substantial up- or downward movement in auto companies' stock prices.

Our results in Table 10 highlight the differences across firms and categories and can be related to firms' product strategies and category growth trends. For example, from 1996 to 2001, Ford experienced a shift in emphasis from quality of manufacturing to customer service and cost reductions, under the leadership of its CEO Jack Nasser. The former included service improvements offered by the dealers and improvements in the interface to the consumers through ventures such as Ford Direct. Ford achieved cost reductions through price discounts from its suppliers and manufacturing-related cost savings. In contrast, Chrysler (through its design chief Bob Lutz) was emphasizing innovative, appealing design during this period. For example, Chrysler introduced the highly successful Dodge Durango and Jeep Liberty in the SUV category and the PT Cruiser in the small-cars category. Our results in Table 10 indeed reflect the success of Chrysler's innovation-focused product strategy compared with that of Ford: Chrysler has greater positive effects of new product introductions on firm value than does Ford in all but one category.

For category trends, the SUV category, for example, experienced 12.3% annual growth from 1996 to 2001, whereas the small and midsize sedan categories decreased by 1% and .6% annually, respectively. Our results in Table 10 reflect the market trends because the high-growth SUV category typically has greater effects of new product introductions than do the other lower-growth auto categories.

Our findings have several important implications for new product and promotion strategies. First, to boost the long-term market capitalization of their companies, executives should focus on new product introductions and resist relying on sales promotions. Although consumer incentives may yield increased short-term performance and/or prevent severe sales erosion while new product projects are in the pipeline, they do not provide a viable long-term answer to the manufacturer's challenges in the industry (*The Wall Street Journal* 2002c).

Second, although in the short run investors often view product introduction favorably, their reactions unfold over time, so market acceptance of the introduction is an important component in determining its long-term impact on firm value. This finding supports the idea that innovative firms need to pay special attention to appropriating new product introduction rewards in the marketplace to enhance stock returns (Kelm, Narayanan, and Pinches 1995; Mizik and Jacobson 2003; Pardue, Higgins, and Biggart 2000). In this regard, investors most value entries into new markets (i.e., Level 5).

Third, managers need not always incur the high development and launch costs that are associated with major product innovations. Indeed, the U-shaped relationship between innovation level and long-term firm valuation implies that firms can benefit from "pulsing" innovations (i.e., provide minor improvements to their new market entries rather than engage in continuous intermediate-level innovation). This finding corroborates the argument in favor of fast new product development and launch, followed by fine-tuning the product on the basis of market feedback (Smith and Reinertsen 1991). A recent study of many categories indicates that "incremental innovations can be drivers of brand growth in their own right" if they represent additional consumer benefits and are introduced more frequently than competitor products (Kashani 2003, p. 57). As a case in point, consider Ford's decision to return Lincoln to profitability based on relatively minor changes with lower development costs (aimed to position Lincoln as an "American luxury" brand), instead of making the major leap toward a global luxury brand at substantially higher costs (*The Wall Street Journal* 2002b). This move is "quite possibly exactly what Lincoln's customers—and Ford investors—would prefer" (*The Wall Street Journal* 2002b, p. B4).

This study has some limitations that provide worthwhile avenues for further research. First, although our data period (1996–2001) is substantial, it covers only a fraction of the history of the automobile industry and does not feature major innovations that occurred before 1996. Indeed, important breakthroughs and new-to-the-world products, such as four-wheel traction and minivans, may receive considerably greater long-term benefits than even the new market entries in our data period. In the same vein, we focused on new product introductions and did not examine process innovations. Second, we analyzed only one industry, albeit one in which new product introductions and sales promotions play a major role in marketing strategy. A validation of our results in other industries is an important area for further research. Third, this research has assessed the average performance impact of new product introductions, but it leaves the explanations of differences in effects across firms and categories for further studies. Moreover, additional work could address the importance of the relative innovativeness of a company compared with competitive offerings in explaining the observed performance results. Finally, researchers might investigate consumer acceptance ratings that are available before launch and thus may help predict the performance impact of specific introductions. Likewise, knowledge of when management realizes the failure of a new product introduction may shed light on managerial action to remedy the situation, including either more new products or more promotions.

In conclusion, the marketing literature to date has provided several insights into the benefits and risks of new product introductions for consumers and firms. Our research adds an important dimension: The investor community rewards innovative firms by their willingness to pay a premium in valuation, and this premium gradually increases for several weeks after the new product launch. Furthermore, innovation policy is an antidote against firms' dependence on sales promotions, which depress firm value. In the words of General Motors' chief financial officer, John Devine (JDPA 2002a, p. 1), "in terms of driving profits in the [United States], it's about getting products right."

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