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Customer Satisfaction, Cash Flow, and Shareholder Value

Thomas S. Gruca and Lopo L. Rego

Investments in customer satisfaction are resources well spent: satisfied customers are central to creating shareholder value. By increasing a firm's cash flow and reducing its cash flow variability, higher levels of customer satisfaction decrease a firm's cost-of-capital and improve bottom-line performance.

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Report Summary

How can marketers better link their activities to the measures that matter most to CEOs? Here, authors Gruca and Rego do so by examining the impact of customer satisfaction on a firm's operational cash flows, a key determinant of shareholder value.

Since satisfied customers are less likely to defect and are more receptive to a firm's offerings, the authors suggest, increases in customer satisfaction will improve a firm's future cash flow and diminish its variability over time. Increased and less-volatile cash flows, in turn, decrease the firm's cost-of-capital, thus further boosting shareholder value.

Using the American Customer Satisfaction Index (ACSI) and the COMPUSTAT database, they compile a nationally representative dataset, including 200 members of the Fortune 500, which spans the years 1994-2000. They estimate their model using a hierarchical linear model which allows them to examine whether industry-level (i.e., market concentration) or firm-level (i.e., firm size) variations explain cash-flow differences.

Overall, they find that customer satisfaction creates shareholder value by significantly increasing a firm's cash flow and reducing cash flow variability. More specifically, a one-point increment in a firm's customer satisfaction score (measured on a 0-100 index score) results in an increase of over 7% in a firm's future net operational cash flow (an average of $40 million for their dataset) and a decrease of 4% in its variability. The resulting growth in cash flow and decrease in a firm's cost-of-capital will significantly influence its bottom line and value to shareholders.

Industry differences account for a significant portion of differences in future cash flow across firms: the influence of customer satisfaction on cash flow growth and variability is stronger for firms operating in more-concentrated industries. However, firm size does not have an impact on these relationships.

As managers seek to link their activities to the measures of most concern to top management, this study offers important evidence that investments in customer satisfaction represent resources well spent: satisfied customers are central to creating shareholder value. ■

Introduction

Until recently, academics and practitioners measured the impact of marketing actions (such as advertising campaigns or pricing policies) on firm performance in such terms as sales growth or market share. This functional focus has evolved into a search for understanding how marketing impacts the entire organization, specifically through the creation of value for shareholders (Day and Fahey 1988; Hunt and Morgan 1995; Srivastava, Shervani, and Fahey 1998).

In this domain, two important trends are evident. First, researchers are shifting away from analysis of simple marketing actions to investigating multifaceted constructs such as brand equity, loyalty, and customer satisfaction (Ambler et al. 2002). Among these, customer satisfaction has become preeminent because it is applicable to a wide range of organizations, has recognized behavioral impacts on consumers, and has positive economic consequences for the firm (Anderson, Fornell, and Rust 1997; Fornell et al. 1996; Reichheld 1996).

Second, there is an evolving debate about how to measure shareholder value (Copeland 2002; Garbi 2002; Guenther and Young 2000). Among the proposed measures (market-to-book ratios, price-earnings ratios, Tobin's Q ratio, and so forth) most academics (Kerin, Mahajan, and Varadarajan 1990; Srivastava, Shervani, and Fahey 1998) and practitioners (Rappaport 1986; Deimler and Whitehurst 1999; Lambert 2000) agree that future cash flow is the most appropriate measure of a firm's value to shareholders.

Building on these two trends, this study examines the association between customer satisfaction and future cash flows, with the goal of better understanding how marketing activities affect shareholder value. Academics, practitioners, and investors each have a unique angle of interest in this research. For academics, the study confirms that customer satisfaction is an important marketing metric; it also advances understanding of related economic consequences. For managers, the study links investments that improve customer satisfaction to the organization's future cash flows. Finally, for investors, the study demonstrates that two drivers of a firm's future cash flow—growth and reduced variability—are crucial for accurate firm valuation.

Linking Customer Satisfaction and Shareholder Value

As the formal owners of the firm, shareholders are an important constituency whose interests should be included in a manager's evaluation of decision alternatives (Day and Fahey 1988). In order to align the interests of managers with those of the shareholders, boards of directors often link a large proportion of a top executive's pay to the firm's stock price through options or other incentives related to the stock's price (Guay 1999; Morgan and Poulsen 2001). Increasing a firm's stock price may seem the most obvious way to increase shareholder value, but it has important limitations. The most obvious is that a wide range of factors, many beyond the control of executives, can influence the price of a stock without correlation to the stock's actual value. As explained by Merrill Lynch analyst Mark Lambert (2000), "Price balances supply and demand, and the investment industry stock markets provide a great forum to establish [the] equilibrium price [of a share of common stock]" (p. 10). In the long run, the price of a stock must equal its value. However, "in practice—and particularly in the short term—other factors materially influence price and can take it away from value" (ibid).

A stock's value can be more readily assessed using the discounted cash flow model (Rappaport 1986). According to this valuation method, managers should seek to maximize future cash flows and to minimize the risks associated with them in order to maximize shareholder value (Rappaport 1986; Srivastava, Shervani, and Fahey 1998). By increasing future cash flow and decreasing its variability over

time, a firm reduces its costs of capital and increases shareholder value.[1]

Srivastava, Shervani, and Fahey (1998) suggest that market-based assets such as customer relationships create value for customers which, in turn, results in improved market performance and increased shareholder value. A firm's relationship with its customers can be gauged by assessments of customer satisfaction. As noted by Fornell (2002), "Satisfied customers can be viewed as economic assets that yield future cash-flows" (p.6).

In fact, satisfied customers are less price sensitive and less likely to defect to competing products (Fornell et al. 1996). Furthermore, satisfied customers complain less (Fornell and Wernerfelt 1987), exhibit increased retention rates (Anderson, Fornell, and Lehmann 1994; Reichheld 1996), and are more receptive to cross-selling efforts (Fornell 1992). These consequences of satisfaction generate cash flow growth over time and decrease the variability in the firm's cash flows. In short, organizations with satisfied customers only have to pay to acquire them once rather than competing for each and every sale on the basis of price, with the corresponding loss in margin.

The construct of customer satisfaction has important advantages over alternative multifaceted indicators (Srivastava, Shervani, and Fahey 1998, 1999). First, there are a number of proven research tools that an organization can use to ascertain the degree to which its customers are satisfied (Fornell et al. 1996). Second, increased customer satisfaction, as indicated by these measures, has been shown to shape consumer behavior in ways that result in superior marketplace performance, as noted above. Third, there are concrete actions a company can take to improve customer satisfaction. Given that customer satisfaction means better marketplace performance, which in turn leads to increased and less volatile cash flows, which then lead to increased shareholder value, this research will be of great value to managers.

Measuring Customer Satisfaction

Customer satisfaction is measured using the American Customer Satisfaction Index (ACSI) database, the first comprehensive U.S. customer satisfaction database (Fornell et al. 1996). Data are collected at the consumer level; more than 50,000 respondents have been surveyed via computer-aided telephone interviews every year since 1994. Respondents are questioned on 15 indicator variables, such as their overall post-purchase evaluation of quality and overall satisfaction with the purchase experience, which are then used to compute six latent constructs (as detailed in Fornell et al. [1996]), including an overall customer satisfaction index for each service or good in the database.

The survey rates customer satisfaction with the products or services of more than 200 Fortune 500 companies (both private and public) in 40 industries, providing a sample of goods and services that is representative of the United States as a whole. In some respects, the ACSI can be described as an economic indicator, since the sales volume of the firms surveyed represents more than 40% of the U.S. gross domestic product. Additionally, the ACSI allows for across-firm and across-industry comparisons as well as for comparisons with other economic indicators, including major stock indexes such as the Dow Jones Industrial and the S&P 500 (Fornell et al. 1996).

Measuring Shareholder Value

Although a number of papers have examined the relationship between customer satisfaction and firm performance, most rely on proxy measures of shareholder value.[2] We propose to model future cash flow as the source of shareholder value since it is both forward-looking and consistent with the current theories of firm valuation. Finance researchers have long proposed that the value of a firm to shareholders equals the net present value of all future cash flows (Casey 2001; Howell 2002;

Rappaport 1986). Marketing scholars have also supported future cash flow as an appropriate measure of shareholder value (Day and Fahey 1988; Hunt and Morgan 1995; Srivastava, Shervani, and Fahey 1998, 1999). Last, but not least, different discounted cash flow methods (differing with respect to how they treat taxes and their definition of cash flow) yield the same value of the company to shareholders (Fernandez 2002).

By relating two key characteristics of cash flows—growth and variability—to customer satisfaction instead of relying on proxy measures, we can gain a detailed picture of how customer satisfaction contributes to shareholder value via increased and less volatile cash flows.

Cash Flow Model

We build on accepted models of cash flows[3] in our examination of the relationship between shareholder value and customer satisfaction. The fundamental premise of our model is that future cash flows are determined by current-period cash flows and earnings and the current level of customer satisfaction. Thus, we seek to understand how customer satisfaction affects future cash flow over and above the known impact of current accruals (based on current cash flow and current earnings).

Since the relationship between customer satisfaction and other measures of firm performance varies across industries, we also investigate the effects of firm size and market concentration on a firm's ability to translate customer satisfaction into superior cash flows. We employ a hierarchical linear model that allows us to control for firm size, measured by the average industry book value *(BookValue)*, and for market concentration, measured by the industry Hirschmann-Herfindahl Index (HHI).

Finally, to test the impact of customer satisfaction on the variability of future cash flows, we use the coefficient of variation of quarterly cash flows for each year—which measures how variable the firm's cash flows are compared to the average market cash flow variability. The complete model formulation can be found in Appendix 1.

To estimate the model, we used ACSI data for the years 1994-2000, combined with COMPUSTAT data (for net cash flow from operations and net income before extraordinary items). The COMPUSTAT database was also used to compute industry averages for book value. Additionally, market share data were collected for all the companies in the dataset[4] and used to compute the Hirschmann-Herfindahl Index[5] of market concentration. This resulted in 735 independent observations in 26 industries, for seven years (1994-2000).

To estimate the impact of customer satisfaction on the variability of future cash flows, the variability of a firm's cash flow during a given year was compared to the variability of the broader market's cash flow. We used the S&P 500 as a proxy for the broader market. This resulted in 530 observations in 26 industries over the seven-year period. Table 1 lists the 26 industries and number of firms included in the analyses, as well as the industry's average satisfaction score and cash flows in dollars.

A comprehensive discussion of model estimation can be found in Appendix 2.

Findings

Cash flow growth

Overall, the results indicate that investments in customer satisfaction create shareholder value. That is, investments in customer satisfaction improve growth of future cash flows for the firm.

In economic terms, for every $1,000 in assets, a one-point increase in customer satisfaction generates an additional $7.70 in net operating cash flows per year. The average cash flow generated by the firms in our sample is $106 per

Table 1
Sample Descriptives

Industry	Firm-Year Observations	Average Satisfaction	$Cash Flow per $1,000 in Assets
Beverages: soft drinks	21	85	179
Personal-care products	22	84	143
Household appliances	18	84	96
Food processing	75	83	117
Parcel delivery: express mail	11	83	144
Consumer electronics	32	82	39
Beverages: beer	14	81	153
Tobacco: cigarettes	10	80	91
Apparel	24	80	101
Automobiles	53	80	79
Gas: service stations	38	79	133
Telecommunications: long distance	17	77	139
Athletic shoes	12	76	116
Telecommunications: local	32	75	157
PCs and printers	24	74	149
Utilities: electricity	107	74	69
Department and discount stores	45	74	79
Supermarkets	44	74	130
Personal-property insurance	7	74	32
Hotels	18	73	102
Specialty retail stores	22	72	84
Life insurance	7	72	8
Publishing: newspapers	12	71	118
Banks	11	71	101
Airlines: scheduled	35	67	133
Fast-food, pizza, carry-out	24	67	142

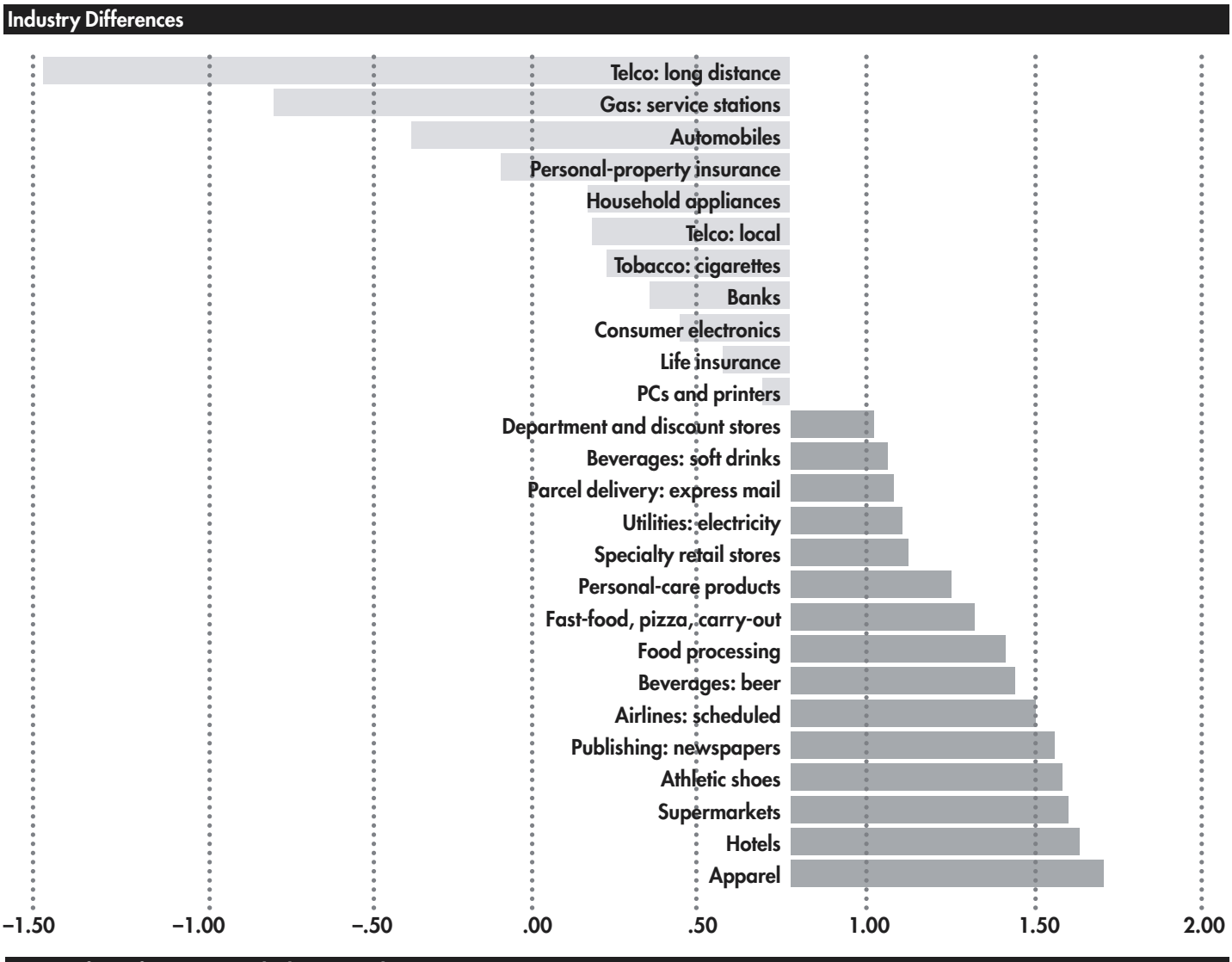
$1,000 of assets. Therefore, a one-point increase in customer satisfaction increases future cash flows by more than 7%. To put this amount in perspective, consider that the average firm in our dataset has $52 billion in assets. A one-point increase in customer satisfaction for such an "average firm" would translate into an increase in future cash flow of $40 million, clearly a substantial figure.

Further, the ability of firms to use past cash flows and earnings to generate current cash flows does not vary with firm size (i.e., scale). Estimates also indicate that a firm's ability to convert investments in customer satisfaction into future cash flows does not vary with firm size.

Importantly, more-concentrated markets exhibit higher levels of cash flows, a finding that may be of some interest to public policy makers. It appears that market power is being converted into higher economic rents via increased future cash flows. On the other hand, a firm's ability to convert earnings into cash flows does not vary with market concentration. Finally, firms in concentrated industries exhibit a significant advantage in converting investments in customer satisfaction into future cash flows.

Figure 1

Satisfaction and Cash Flow Growth: Industry Differences



The horizontal axis details how parameter estimates for β_3 in Table A3: Equation 2b vary across industries.

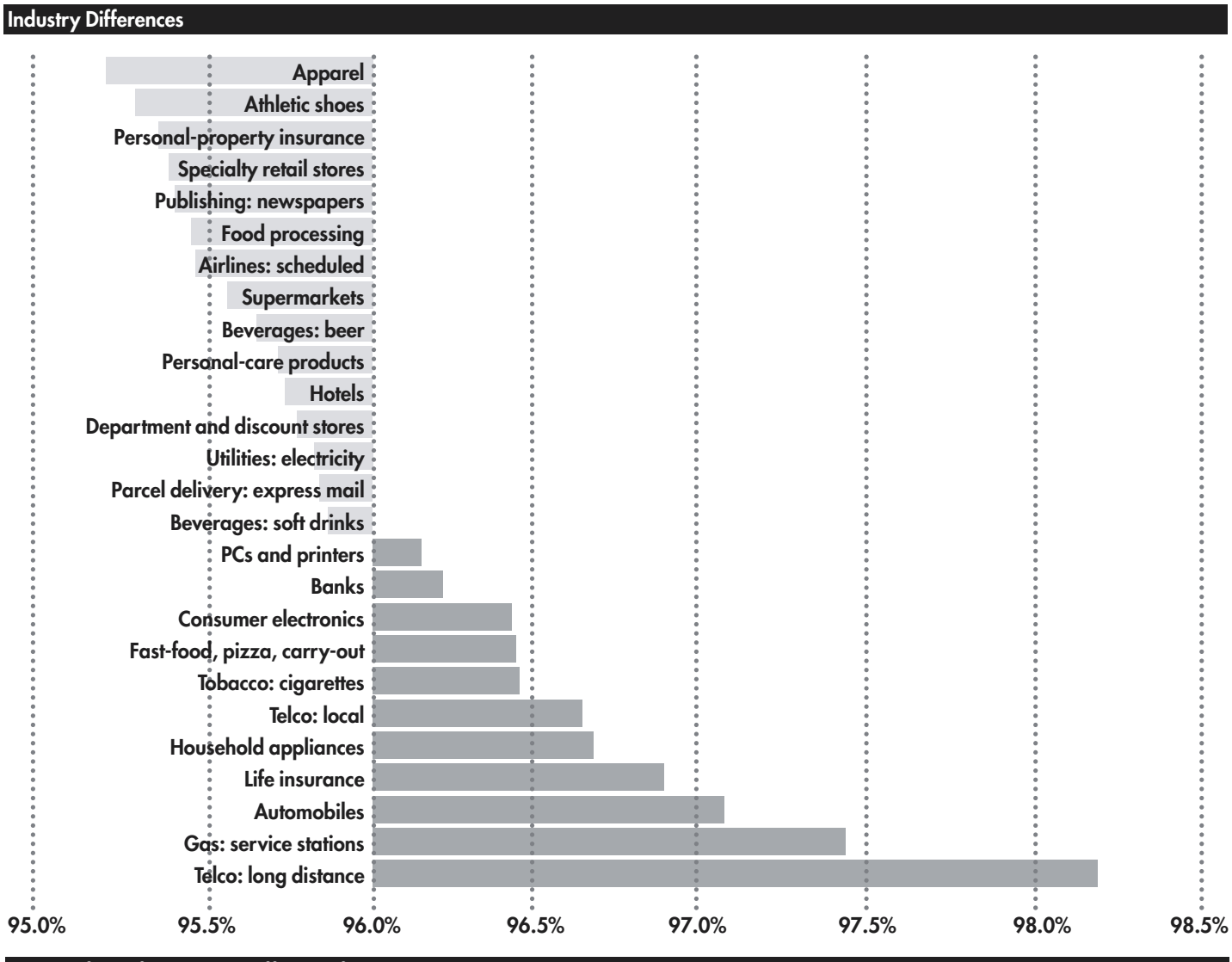
As Figure 1 illustrates, the influence of customer satisfaction on cash flow growth is largest for low-involvement, routinized, and frequently purchased products, such as newspapers, beer, and pizza, and smallest for big-ticket, high-involvement, and less frequently purchased goods, such as automobiles, insurance, and household appliances. Interestingly enough, Figure 1 also reveals that additional investments in customer satisfaction can actually decrease cash flow for some industries. Two of these are extremely capital intense (long-distance telecommunications and the auto industry).

Cash flow variability

The results suggest that investments in customer satisfaction reduce the variability associated with a firm's future cash flows. This effect reduces the firm's cost-of-capital and consequently creates shareholder value.

Figure 2

Satisfaction and Cash Flow Variability: Industry Differences



The horizontal axis details how parameter estimates for β_2 in Table A4: Equation 3b vary across industries.

In economic terms, a one-point increase in customer satisfaction reduces the variability associated with the firm's cash flows by around 4%.[6]

Further, firm size does not have a significant impact on the association between customer satisfaction and variability. In addition, more-concentrated industries exhibit greater cash flow variability, but this relationship is lacking when it comes to a firm's ability to use investments in customer satisfaction to reduce that variability.

Overall, as Figure 2 illustrates, investments in satisfaction reduce cash flow variability the most for low-involvement, routinized, and frequently purchased products. It is important to note that while investments in customer satisfaction do not always result in increased cash flow growth, those investments do always result in decreased variability of future cash flows.

A complete analysis of results can be found in Appendix 3.

Discussion

In this study, we showed that customer satisfaction has a positive effect on cash flow growth and contributes to decreased cash flow variability, thereby creating shareholder value. Overall, this research makes several important contributions.

First, we found that the association between customer satisfaction and a firm's ability to generate future cash flows is not negligible. A single-point increase in the ACSI score represents an increase of more than 7% in average cash flows. This may mean an additional $40 million in cash flows from operations per year for the average firm in our dataset. It is clear that satisfied customers are central to creating shareholder value.

Second, we examined the direct impact of customer satisfaction on shareholder value rather than using a proxy measure of the firm's value. In addition, by modeling the effect of customer satisfaction on future cash flow growth and variability separately, we gain a more detailed understanding of how customer satisfaction affects shareholder value. That is, customer satisfaction creates shareholder value primarily by stimulating growth in future cash flows. The cash flow-variability link between satisfaction and shareholder value is less robust, with only directional but non-significant support being identified.[7]

Finally, this research showed that industry differences account for a significant portion of the differences in future cash flow across firms (36%) and the associated variability of future cash flow (52%).

Future Research

Although the significant cross-category variation validates the use of the hierarchical methodology, its magnitude is also one of the limitations of this study, since it may indicate omitted industry characteristics. Although we explored several alternative model specifications, future research should seek to address these limitations and expand the scope of the current study.

An important direction for future research is to examine the influence of customer satisfaction on the third attribute of interest for cash flows: acceleration. In addition, direct modeling of some of the context effects unveiled (for example, frequency of purchase and degree of customer involvement with the product), as well as other measures of industry type, such as business focus, product differentiation, and communication efforts, may prove valuable; those effects are likely related to previously established relationships between satisfaction and marketplace performance, such as increased repeat purchasing, greater success with cross-selling and so on. Last but not least, exploring the linearity (or lack thereof) of these relationships and the existence of increasing and/or decreasing returns to scale may prove very useful to guide managers in their investment decisions regarding building and maintaining specific levels of customer satisfaction. ■

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Appendix 1: Model Formulation

The basic model formulation is:

$$Cash\text{-}Flow_{(t+1)} = f(Cash\text{-}Flow_{(t)}; Earnings_{(t)}; Customer\ Satisfaction_{(t)} \mid Industry\ Characteristics_{(t)}) \quad (1)$$

The fundamental premise is that future cash flows (at time $t + 1$) are determined by current-period (t) cash flows and earnings (Dechow, Kothari, and Watts 1998) and the current level of customer satisfaction. The main focus of this research is on understanding how customer satisfaction affects future cash flow over and above the known impact of current accruals (based on current cash flow and current earnings).

The relationship between customer satisfaction and other measures of firm performance varies across industries (Anderson, Fornell, and Rust 1997; Fornell et al. 1996). However, the sources of this heterogeneity have hitherto not been modeled in a systematic and comprehensive fashion.

To investigate potential sources of industry-level variance, we draw upon the literature in the field of industrial organization economics, which focuses on the effects of firm size and market concentration on firm performance. By including market concentration in our model, we can determine how market structure affects a firm's ability to translate customer satisfaction into superior cash flows (Jayachandran, Gimeno, and Varadarajan 1999; Tirole 1997). Firm size helps us understand if there are scale differences in the relationship between customer satisfaction and cash flow (Schmalensee 1989; Shy 1995). Overall, we expect to gain a better understanding of how the relationships between customer satisfaction and measures of cash flow are influenced by the context in which satisfaction is determined.

Future Cash Flow Growth Model

In order to model the effects of customer satisfaction on cash flow growth, we base our formulation on current research on predicting future cash flows in the accounting and finance literatures (e.g., Dechow, Kothari, and Watts 1998). Our firm-level model is given by Equation 2a:

$$Firm\ Level: CashFlow_{(t+1)ij} = \beta_{0j} + \beta_{1j} \cdot CashFlow_{(t)ij} + \beta_{2j} \cdot Earnings_{(t)ij} + \beta_{3j} \cdot Satisfaction_{(t)ij} + r_{ij} \quad (2a)$$

Future cash flow for firm i in industry j at time t is a function of current cash flow (β_{1j}), current earnings (β_{2j}), and current level of customer satisfaction (β_{3j}). The term $\boldsymbol{r}_{ij}$ is a random error.

Research on cross-industry differences in cash flow modeling (Cipriano, Collins, and Revsine 2002) suggests that a firm's cash flow is determined in part by the industry in which it competes. Therefore, we expect that the firm-level parameters in Equation 2a (β_{0j}, β_{1j}, β_{2j} and β_{3j}) are likely to vary across industry. These effects are modeled in Equation 2b, below:

$$\begin{aligned} Industry\ Level: \beta_{0j} &= \gamma_{00} + \gamma_{01} \cdot BookValue_{(t)j} + \gamma_{02} \cdot HHI_{(t)j} + u_{0j} \\ \beta_{1j} &= \gamma_{10} + u_{1j} \\ \beta_{2j} &= \gamma_{20} + \gamma_{21} \cdot BookValue_{(t)j} + \gamma_{22} \cdot HHI_{(t)j} + u_{2j} \\ \beta_{3j} &= \gamma_{30} + \gamma_{31} \cdot BookValue_{(t)j} + \gamma_{32} \cdot HHI_{(t)j} + u_{3j} \end{aligned} \quad (2b)$$

In this formulation, we model variations of the firm-level parameter estimates for the intercept, earnings, and satisfaction (β_{0j}, β_{2j}, and β_{3j}), as a function of two influences. The first is scale effects, as measured using the average industry book value (*BookValue*). The second is the level of market concentration, as measured by the industry Hirschmann-Herfindahl Index (HHI). Following research on how sales are translated into earnings and cash flows through the accrual process, the parameter estimate for current cash flow (β_{1j}) is modeled as following a random walk (Dechow, Kothari, and Watts 1998; Finger 1994).

The cash flow growth hypothesis is tested via the sign and magnitude of β_{3j} (in practice, this is the parameter γ_{30}), which measures the influence of satisfaction on future cash flows. The role of differences in firm size and market concentration on the association between satisfaction and cash flow growth are measured using the parameters γ_{31} and γ_{32}.

Future Cash Flow Variability Model

To test the impact of customer satisfaction on the variability of future cash flows, we have to construct a measure of cash flow variance. In this paper, we use the coefficient of variation of quarterly cash flows for each year (Rajgopal and Shevlin 2002). Our model is presented in Equation 3a.

$$Firm\ Level: CV_{(t+1)ij} = \beta_{0j} + \beta_{1j} \cdot CV_{(t)ij} + \beta_{2j} \cdot Satisfaction_{(t)ij} + r_{ij} \quad (3a)$$

Equation 3a models the coefficient of variation of cash flows as a random-walk process. Specifically, the coefficient of variation at ($t + 1$) for firm i in industry j is a function of the current (t) coefficient of variation (β_{1j}) as well as the level of customer satisfaction (β_{2j}). As in Equation 2a, firm-level parameter estimates are expected to vary across industry, particularly with scale differences and market structure. Details are given in Equation 3b.

$$\begin{aligned} Industry\ Level: \beta_{0j} &= \gamma_{00} + \gamma_{01} \cdot BookValue_{(t)j} + \gamma_{02} \cdot HHI_{(t)j} + u_{0j} \\ \beta_{1j} &= \gamma_{10} + u_{1j} \\ \beta_{2j} &= \gamma_{20} + \gamma_{21} \cdot BookValue_{(t)j} + \gamma_{22} \cdot HHI_{(t)j} + u_{2j} \end{aligned} \quad (3b)$$

As was the case for the impact of customer satisfaction on future cash flow growth, the impact of customer satisfaction on future cash flow variability is determined by the sign and magnitude of the coefficient in the firm-level model (β_{2j}) or, in this case, the parameter γ_{10}. Context effects caused by scale or market concentration are determined using the same approach as in Equation 2b, that is, by the coefficients γ_1 and γ_2 in the industry-level models.

Appendix 2: Model Estimation and Data

To estimate the models, we use a hierarchical linear model (Aitkin and Longford 1986; Bryk and Raudenbush 1992; Goldstein 1987), which builds on familiar concepts from regression and analysis of variance for the estimation of multilevel or nested models. Hierarchical linear models (HLM) are particularly relevant for this study because of the nature of the data and our research questions. In addition to the parameter estimates for the above models, we are also interested in understanding the degree to which industry-level and firm-level variations explain differences in future cash flows. The HLM methodology allows us to separate these two components by modeling an individual firm's future cash flow as a distribution about the industry mean and by modeling these as a distribution of industries around the grand mean. Given the potential for context effects, the HLM methodology is appropriate since firms within an industry tend to be more similar to one another than to a random sampling of firms from the entire population.

We used ACSI data for the years 1994-2000, made available by the National Quality Research Center at the University of Michigan Business School. Fornell and colleagues (1996) provide extensive details on the methodology of the ACSI database. These data are combined with COMPUSTAT data to estimate the impact of customer satisfaction on cash flow growth and variability. More specifically, net cash flow from operations (COMPUSTAT Data Item No. 308), and net income before extraordinary items (COMPUSTAT Data Item No. 18, i.e., earnings) were collected from the COMPUSTAT database.

The COMPUSTAT database was also used to compute industry averages for book value (COMPUSTAT Data Item No. 216). Additionally, market share data was collected for all the companies in the dataset and used to compute the Hirschmann-Herfindahl Index of market concentration.

Given that cash flows vary widely depending on firm size, some normalization of this data was required. Following prior studies on predicting future cash flows (e.g., Cipriano, Collins, and Revsine 2002), we used the firm's total assets in nominal dollars to normalize the cash flow data (that is, we divided net operational cash flows by assets). The earnings data were standardized in the same manner. Given that ACSI is an index, no normalization was necessary.

To estimate equations 3a and 3b, coefficients of variation for cash flow at the firm level were computed on a yearly basis using quarterly cash flow data. The variability of a firm's cash flow during a given year was compared to the variability of the broader market's cash flow. We used the S&P 500 as a proxy for the broader market. The specific formula is given by:

$$\sqrt{\sum (x - \bar{x}_{SP500})^2 / (n-1)} \Big/ \bar{x}_{SP500}$$

A coefficient of variation equal to one indicates that the firm's cash flows are as variable as the market's cash flows. Likewise, a coefficient of variation above one indicates that the firm's cash flows are more variable than the market's, while a coefficient of variation below one indicates the opposite. Since the relative coefficients of variation that we obtained exhibited extreme non-normality, we utilized a logarithm transformation. Note that this transformation will have implications for how we interpret the parameters obtained from estimating equations 3a and 3b.

The overlap between the ACSI and COMPUSTAT datasets resulted in 735 independent observations in 26 industries over the seven-year period under analysis (only 630 observations for equations 3a and 3b, because one year of data was given over to the computation of the coefficients of variation). Table A1 summarizes descriptive statistics for the three datasets.

Simple exploratory univariate analyses were performed to gain a feel for the associations between the main variables. These exploratory analyses are summarized in Table A2. The sizeable correlations found between contemporaneous cash flows and earnings confirm the significance of accruals in the cash flows process. Additionally, a positive correlation was found between satisfaction and cash flows and earnings. Finally, the correlations between the contemporaneous coefficients of variation and satisfaction portray a similar picture for the cash flow variability hypothesis.

The sizeable correlations between the cash flow variables might indicate autocorrelation, which would invalidate the findings from these analyses. We tested for this possibility using the traditional Durbin-Watson test and the more robust modified Box-Pierce Q statistic (Lobato, Nankervis, and Savin 2001) and found that autocorrelation was not an issue.

Appendix 3: Analyses and Findings

Cash Flow Growth

Table A3 details the relationship between customer satisfaction and cash flow growth. The second column in Table A3 summarizes the estimates for the unconditional model formulation, under which cash flow at time (t + 1) is modeled as a simple one-way analysis of variance, with variance examined at two levels: firm level and industry level. (For every model specification, an unconditional formulation was estimated. This formulation is equivalent to a one-way analysis of variance and provides a base model for comparisons of fit and parameter estimates.) The third column in Table A3 details the estimates for the full conditional formulation (equations 2a and 2b). By comparing the two specifications, we can

Table A1
Descriptive Statistics

Variable	*N*	Mean	Standard Deviation	Q1	Median	Q3
$Cash\ Flow_{t+1}$	832	106.92	68.88	66.45	102.49	142.59
$Cash\ Flow_t$	984	105.96	67.43	66.33	102.48	143.02
$Satisfaction_t$	1,006	76.37	6.17	71.89	76.83	81.17
$Earnings_t$	1,057	45.81	66.96	18.50	44.85	77.84
Valid N (Listwise)	735					
$ln(CV_{t+1})$	669	−.51	.98	−1.11	−.57	.05
$ln(CV_t)$	681	−.50	.98	−1.10	−.58	.06
Valid N (Listwise)	630					

Table A2
Exploratory Analyses

Equation 2	$Cash\ Flow_{t+1}$	$Cash\ Flow_t$	$Earnings_t$	$Satisfaction_t$
$Cash\ Flow_{t+1}$	1.000			
$Cash\ Flow_t$	.662	1.000		
$Earnings_t$	.503	.591	1.000	
$Satisfaction_t$	.178	.160	.096	1.000

Equation 3	$ln(CV_{t+1})$	$ln(CV_t)$	$Satisfaction_t$
$ln(CV_{t+1})$	1.000		
$ln(CV_t)$	.652	1.000	
$Satisfaction_t$	.060	.061	1.000

Note: All correlations significant at $\alpha = .01$

determine the benefits resulting from including the covariates.

Overall, the degree of fit is appropriate for the two model specifications. The χ^2 statistic and the reliability measures are all well within the acceptable range. The unconditional model estimations indicate that 35.53% of the variance in cash flow is attributable to industry differences, while the remaining 64.47% is caused by firm differences. The inclusion of the covariates improves the degree of fit and the reliability of the estimates. Additionally, with the inclusion of the covariates, the percentage of variance in cash flow that is attributable to industry differences increases to 46.64%.

Closer inspection of the firm-level estimates indicates that current cash flows, current earnings, and current customer satisfaction (at time *t*) jointly determine future cash flows (at time $t + 1$). All estimates are significant and reliable. A 31% carryover of current cash flow to future cash flow confirms the random-walk process suggested. Additionally, current earnings have a positive carryover effect (12%) on future cash flows. These estimates are consistent with existing accounting and finance research on the determinants of cash flow (Dechow, Kothari, and Watts 1998).

The positive and significant estimate for $\beta 3$ (.77) substantiates customer satisfaction as a relevant variable in

Table A3

Equation 2

Dependent Variable Cash flow$_{(t+1)}$	**Unconditional Model**	**Conditional Model**
Firm-level estimates		
Intercept (β_0 / γ_{00})	110.06	6.13
p-value	(.00)	(.00)
Cash flow$_{(t)}$ (β_1)		.31
p-value		(.00)
Earnings$_{(t)}$ (β_2)		.12
p-value		(.01)
Satisfaction$_{(t)}$ (β_3)		.77
p-value		(.01)
Industry-level estimates		
Book value on intercept (γ_{01})		–.00
p-value		(.71)
Book value on earnings$_{(t-1)}$ (γ_{21})		.00
p-value		(.30)
Book value on satisfaction$_{(t-1)}$ (γ_{31})		–.00
p-value		(.32)
HHI on intercept (γ_{02})		6.33
p-value		(.03)
HHI on earnings$_{(t-1)}$ (γ_{22})		–.74
p-value		(.32)
HHI on satisfaction$_{(t-1)}$ (γ_{32})		.63
p-value		(.05)
Variance components		
Between industries (industry level)	1,486.66	1,825.56
Within industries (firm level)	2,697.87	2,088.34
Percentage of variance in cash flow$_{(t+1)}$ explained at the industry level	35.53%	46.64%
Measures of fit		
Likelihood ratio test, χ^2	343.17	463.98
p-value	(.00)	(.00)
Reliability	.89	.92
Likelihood function	–5,484.15	–5,346.22
Sample size		
Firms	735	735
Industries	26	26

Table A4
Equation 3

Dependent Variable Coefficient of variation: $ln\ CV_{(t+1)}$	**Unconditional Model**	**Conditional Model**
Firm-level estimates		
Intercept (β_0 / γ_{00})	–.54	1.13
p-value	(.00)	(.00)
$ln\ CV_{(t)}$ (β_1)		.27
p-value		(.00)
$Satisfaction_{(t)}$ (β_2)		–.04
p-value		(.17)
Industry-level estimates		
Book value on intercept (γ_{01})		–.00
p-value		(.21)
Book value on $satisfaction_{(t)}$ (γ_{21})		.00
p-value		(.35)
HHI on intercept (γ_{02})		1.58
p-value		(.03)
HHI on $satisfaction_{(t)}$ (γ_{22})		–.08
p-value		(.88)
Variance components		
Between industries (industry level)	428.35	645.09
Within industries (firm level)	393.52	333.93
Percentage of variance in $CV_{(t+1)}$ explained at the industry level	52.12%	65.89%
Measures of fit		
Likelihood ratio test, χ^2	420.61	638.38
p-value	(.00)	(.00)
Reliability	.89	.91
Likelihood function	–1,013.99	–940.01
Sample size		
Firms	630	630
Industries	26	26

predicting future cash flow growth and, by extension, the influential role of customer satisfaction in creating shareholder value.

Analysis of the industry-level estimates indicates that firm size (i.e., book value) does not have a significant impact on the association between cash flow and the other covariates.

This suggests that the ability of firms to use past cash flows and earnings to generate current cash flows does not vary with firm size. Estimates also indicate that a firm's ability to convert investments in customer satisfaction into future cash flows does not vary with scale.

The estimates for market concentration (as measured by the Hirschmann-Herfindahl Index) indicate that more-concentrated markets exhibit higher levels of cash flows (estimate for γ_{22}). This result confirms previous industrial organization research (Shy 1995) and may be of some interest to public policy makers. It appears that market power is being converted into higher economic rents via increased future cash flows. On the other hand, the estimate for γ_{22} indicates that a firm's ability to convert earnings into cash flows does not vary with market concentration. Finally, the positive estimate of γ_{32} (.63) indicates that firms in concentrated industries exhibit a significant advantage in converting investments in customer satisfaction into future cash flows.

We also explored the extent to which contextual effects might be driving these results. We accomplished this by computing the posterior industry distribution for each estimate at the industry level and plotting these against the overall average estimates. These results are displayed in Figure 1.

Overall, these results support the hypothesis that investments in customer satisfaction have a positive impact on the growth of future cash flows for the firm. This impact seems to be stronger for firms operating in concentrated industries. (However, since HHI varies between 0 and 1, we need to interpret the estimate of .63 with some caution. Differences in HHI across the data are only tenths of 1 point, suggesting a rather small—but nonetheless significant—impact on the ability to convert satisfaction into future cash flows.)

Cash Flow Variability

Table A4 summarizes the estimates obtained for our model of cash flow variability. The second column details the unconditional model specification and the third column details the inclusion of covariates. The unconditional model indicates that 52.12% of the variance in the coefficient of variation (CV) is attributable to industry differences. This percentage increases to 65.89% for the conditional model (equations 3a and 3b). The reliability and χ^2 of the estimates indicate an appropriate fit for both models.

Analysis of the firm-level covariates indicates the existence of a significant carryover effect from year to year, confirming the random-walk process hypothesized (β_1 estimate). The estimate for β_2 indicates that customer satisfaction reduces the coefficient of variation associated with a firm's cash flows by .04. While in the correct direction, this estimate is not significant at the $p < .10$ level. Due to the log transformation of the dependent variable, the true impact of satisfaction on the coefficient of variation (CV) is given by $e^{-.04}$, or .96. As noted above, this indicates that a one-point increase in customer satisfaction reduces the CV associated with the firm's cash flows by around 4%.

Inspection of the industry-level covariates reveals that scale differences do not have a significant impact on the association between customer satisfaction and the CV. The 1.58 estimate for γ_{22} does suggest that more-concentrated industries exhibit greater cash flow variability, but this relationship is lacking when it comes to a firm's ability to use investments in customer satisfaction to reduce that variability (-.08 nonsignificant estimate for γ_{22}).

As previously, we also examined the contextual effects for the CV results. They are presented in Figure 2.

Notes

1. Since future cash flows are discounted, a given level of cash flow in the present is preferred to that same amount at a future date. This suggests that the acceleration of cash flows is an additional source of influence on shareholder value. We do not model cash flow acceleration in this study.

2. A number of papers have examined the relationship between customer satisfaction and firm performance using data from Sweden (Anderson, Fornell, and Lehmann 1994) as well as the newer ACSI data (Anderson, Fornell, and Rust 1997; Fornell et al. 1996). However, theoretical and operational limitations of the dependent variables used in these studies limit their ability to explain how customer satisfaction affects shareholder value (Srivastava, Shervani, and Fahey 1998). Since "corporate value is determined by what the organization might be worth in the future, not by what it was worth in the past" (Schultz 2002, p.8), any measure of firm performance should be forward-looking. The accounting-based measures used in Anderson, Fornell, and Lehmann (1994) and Anderson, Fornell, and Rust (1997), however, reflect the firm's past decisions and outcomes. Furthermore, the theory behind a particular measure of firm performance should be consistent with empirical reality, which is the drawback to using measures based on stock prices (Ittner and Larcker 1998; Yeung and Emmew 2001) or Tobin's Q ratio (Anderson, Fornell, and Mazvancheryl forthcoming). Both those measures rely on the strong form of the efficient-market hypothesis (that is, that all possible information in a market is accounted for in the price of a stock), which does not hold in practice (Fama 1991). Finally, a measure of firm performance should also be replicable across time and different researchers: measures such as Tobin's Q and economic value added (EVA, Ohlson 1995) suffer from the lack of a consistent definition (Erickson and Whited 2001).

3. Cash flow models have been used extensively in the accounting and finance literatures (see, for example,

Gentry, Kemsley, and Mayer 2003; Karceski 2002). Although different formulations are offered, most relate earnings to cash flows through accrual accounting (Dechow, Kothari, and Watts 1998), and most acknowledge the existence of significant cross-industry differences (Cipriano, Collins, and Revsine 2002).

4. Sources include 10-K filings with the SEC, the *Market Share Reporter*, and the popular press.

5. The Hirschmann-Herfindahl Index is the best overall measure of market concentration (Curry and George 1983) and is a central construct to the field of industrial organization (Tirole 1997).

6. We remind the reader to exercise caution with regard to this interpretation, as this estimate is nonsignificant.

7. It is worth noting that by using the S&P 500 as the benchmark for cash flow variability, this study may be smoothing out its results, as the dataset contains more than 200 Fortune 500 companies, and those companies are also on the S&P 500.

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