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Does the Variance of Customer Satisfaction Matter for Firm Performance?*

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Although much attention has been paid to customer satisfaction (CS) as a leading indicator of firm performance, few studies have investigated the role of CS distribution across individual customers. With 10 years of National Customer Satisfaction Index (NCSI) data in Korea, we examine the relationship between the variance of CS and key corporate performance measures such as revenue, profit, Tobin's q, and stock return.

There are three main findings. First, we confirm the findings of previous studies that the average CS for a firm is related to the firm's economic performance. Second, we find a moderating effect of CS variance such that the relationship between the level of CS and firm performance is attenuated by the variance of CS. Finally, the variance of CS is found to directly affect firm performance over and above the CS level effect. More specifically, the variance decreases sales and stock return.

Key words: Customer Satisfaction, Distribution of Customer Satisfaction, Variance of Customer Satisfaction, Firm Performance, Firm Value

Ⅰ. Introduction

Customer satisfaction (CS) has long been an important topic for both scholars and practitioners. As a major factor influencing consumer behaviors such as positive word-of-mouth communication and repeat-purchase decisions, CS is widely

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accepted as one of the most important managerial goals. Since Oliver's (1980) study of the causes and effects of CS, a number of studies have examined the topic in various dimensions. Previous studies have generally provided empirical evidence of a positive relationship between CS and financial performance (e.g., Ittner & Larcker 1998). For example, Anderson & Mittal (2000) showed that, on average, a 1% increase in CS leads to a 2.37% increase in return on investment (ROI), whereas a 1% decrease in CS leads to a 5.08% decrease in ROI. Anderson et al. (2004) found that a 1% increase in CS leads to a 1.016% increase (an average of USD 250 million) in firm value measured by Tobin's q.

However, other studies have provided conflicting findings. For example, Park and Kim (2003) found an insignificant relationship between CS and firm performance, and some studies have documented a negative relationship between CS and some performance measures (Fornell 1992; Griffin & Hauser 1993). While those differences among the existing studies are partly due to the difference in their samples and study periods, such mixed results have led researchers to conjecture a nonlinear relationship between CS and firm performance (Ittner & Larcker 1998), and an insignificant relationship between CS and long-run returns (Jacobson & Mizik 2009; Ittner et al. 2009). Noteworthy is that all these studies of CS and firm performance, regardless of their findings, have used the average level of CS for a product, a brand, or a firm, and they related this CS level to firm performance by employing either cross-sectional or time series variation.

We contend that one needs to examine distributional characteristics of customer satisfaction to fully understand the relationship between CS and various performance metrics. Among many distributional characteristics available, the variance of CS across customers is particularly important since the metric shows how the levels of individual customers' satisfaction with a firm or its product are dispersed around the average level of CS. This dispersion may moderate the relationship between the average level of CS and firm performance. For example, consider two firms A and B that have three customers each, and let customers in firm A be denoted as 50A, 70A, and 90A, and customers for firm B as 60B, 70B, and 80B, where numbers indicate the levels of CS. Obviously the average CS levels are identical between firm A and B, but the latter may show higher market share or profit if the relationship between the average level of CS and various drivers of firm performance (e.g., repeat purchase rate, service cost) is non-linear or even discontinuous. The non-linear or discontinuous relationship might well exist due to the competitive environment (Jones & Sasser 1995) and the increasing marginal cost of customer satisfying efforts (Chu & Desai 1995). Therefore, ignoring the variance of CS may result in finding inconsistent relationships between the average level of CS and

firm performance. In fact, Sun (2011) found that if the average product rating is low, the demand for the product increases in the variance of the ratings while the opposite relationship can be found when the average product rating is high.

However, only a few studies have examined distributional aspects of CS. Fornell (1995) reported the negative skewness of CS, and Grewal et al. (2010) examined the effects of customer heterogeneity on shareholder wealth. In particular, Grewal et al. (2010) employed data on the U.S. airline industry and found that a change in the variance of a firm's CS from "low" to "high" reduced its value by approximately 70% and that a low degree of CS heterogeneity reduced the volatility of firm value. Given the economic importance of this variance effect, there is a need for studies considering a broader range of industries, a longer time period, and more diverse measures of firm performance for the examination of the distribution of CS. It is also warranted to study a non-US market that has not received much attention by prior studies, since such a study can ensure the robustness of the multi-dimensional relationship between CS and corporate performance.

Though Grewal et al. (2010) used mean-variance decomposition method to infer the variance of CS from the mean of CS, we were able to obtain both the level and the variance of CS from National Customer Satisfaction Index (NCSI) data compiled by the Korea Productivity Center (KPC). Using this unique dataset, this study empirically investigates whether the variance of CS influences firm performance. Specifically, we measure a firm's performance by its accounting earnings, Tobin's q, and risk-adjusted stock returns. For this, we consider two hypotheses about whether (1) the variance of CS influences firm performance over and above the level effect of customer satisfaction (i.e., the main effect) and whether (2) the variance of CS moderates the effect of the average level of CS on firm performance (i.e., the moderating effect). The results indicate that the variance of CS moderated the relationship between the average level of CS and firm performance, that is, this relationship strengthened as the variance of CS decreased. In addition, the variance of CS directly influenced firm performance. All else being equal, the variance of CS increased the firm's sales revenue but reduced its stock returns. Interestingly, the variance of CS increased Tobin's q ratio.

The rest of this paper is organized as follows: Section 2 provides a review of previous research on the effects of CS on firm performance and consumer behavior. Section 3 discusses the research hypotheses. Section 4 describes the data, introduces the model for hypothesis testing, and presents the results. Finally, Section 5 concludes with some important implications and future research suggestions.

Ⅱ. Literature: Customer Satisfaction and Firm Performance

According to Srivastava, Shervani, & Fahey (1998), market-based assets are the key to a firm's success in the market because they have considerable influences on firm performance and thus shareholder value. That is, market-based assets can accelerate and increase cash flows and reduce their volatility, thereby increasing shareholder wealth. In this regard, CS can be considered one of the core market-based assets. Anderson & Mittal (2000) proposed the so-called satisfaction-profit chain, in which CS enhances customer retention and thus facilitates increased profits.

Previous empirical studies of the incremental influence of CS on firm performance can be classified into the following three groups: The first group includes those studies focusing on the relationship between CS and financial performance such as sales and profitability. For example, Anderson et al. (1994; 1997) found CS has a significant and direct effect on ROI. In addition, Anderson et al. (1997) suggested a significant positive relationship between CS and productivity for goods but an insignificant relationship for services. Hallowell (1996) analyzed the relationship between CS and profitability for retail banks and found that CS is positively related to ROA but negatively related to NIE/Rev (noninterest expense as a percentage of total revenue). Ittner & Larcker (1998) determined that an increase in the level of CS can enhance customer retention, increase sales, attract more customers, improve return on sales (ROS), and increase profitability. Using data on 18 hotels, Banker, Potter, & Srinivasan (2000) found a positive relationship between CS and financial performance such as sales and operating profits, and Yeung & Ennew (2000) provided support for their findings. Ittner et al. (2009) confirmed that CS has a positive relationship with revenue, margin, and ROA. Also, Rego et al. (2013) found that CS predicts market share when rival firms' CS and customer switching costs are low.

The second group of studies addresses the relationship between CS and firm value. Using data on Korean firms, Yi, Cha, & Lee (2008) found a positive feedback loop between CS and firm value. Anderson, Fornell, & Mazvancheryl (2004) employed Tobin's q and the market-to-book ratio to indicate that CS has a positive effect on firm value. To explain the positive effect of CS on firm value, Gruca & Rego (2005) suggested that CS can enhance future cash flows while reducing their volatility.

The third group of studies focuses on stock returns by examining how the stock market responds to CS information. If such information is not quickly incorporated into the stock price, then excess or abnormal returns are likely to accrue to stocks associated with a high level of CS. Aksoy et al. (2008) examined four portfolios

based on the level of and changes in CS and suggested that those portfolios reflecting high levels of CS and upward changes perform better than those reflecting low levels of CS and downward changes. O'Sullivan and McCallig (2009) found a direct positive effect of CS on stock return and also an interaction between CS and earnings on stock return. Tuli & Bharadwaj (2009) reported that CS can not only increase stock returns but also reduce the volatility of stock returns. Also, Raithel et al. (2012) confirmed that CS is positively associated with drivers of satisfaction in the automobile industry. Table 1 provides a summary of previous research on CS and firm performance.

Although a number of studies have found a positive relationship between CS to firm performance, some studies have provided conflicting findings. For example, Ittner & Larcker (1998) found a positive relationship between CS and firm performance but suggested that this relationship is not fully reflected in the book value. They explained these phenomena by arguing that CS and firm performance have a nonlinear relationship and that there exists a "threshold level" below which firm performance remains unchanged regardless of the level of CS. The absence of a relationship between CS and stock returns has been found through cross-sectional analyses at the firm level. Anderson et al. (1994; 1997) suggested that CS has a positive relationship with ROI only for firms in the service sector. Tornow and Wiley (1991) showed that various dimensions of CS have negative relationships with a number of indicators of financial performance, and Fornell (1992; 1995) argued the possibility of a negative relationship between CS and the firm's market share under the condition of heterogeneous market demand and standardized supply. In addition, Griffin & Hauser (1993) found a negative relationship between CS and the number of customers (measured by the market share). Finally, Park & Kim (2003) determined that CS has no influence on the market share.

The present paper closes the gap in the literature in two ways. First, we shed some light on the role of the dispersion (variance in particular) of CS in explaining the relationship between CS and firm performance. Examining the variance of CS will provide researchers and managers with additional insights about the role of customer satisfaction on creating firm performance. Second in doing so, we comprehensively investigate the relationship between CS and firm performance. Specifically, we examine (1) revenues and profits, backward-looking and near-term measures of firm performance, (2) firm value as measured by Tobin's q, which reflects investors' expectation of the firm's future performance, and (3) abnormal or excess stock returns, which are driven by "surprises" in the stock market (i.e., the difference between the information available in the stock market and the actual firm value with respect to CS).

〈Table 1〉 Previous Studies of Customer Satisfaction and firm Performance

	Financial Performance	Firm Value	Stock Return
Rust & Zahorik (1993)	Market Share		
Anderson et al. (1994; 1997)	ROI		
Fornell (1995)	Market Share		
Hallowell (1996)	ROA, NIE/Rev[a]		
Ittner & Larcker (1998)	Revenue, Revenue Growth, ROS, Profit Margin		
Anderson & Mittal (2000)	ROI		
Yeung & Ennew (2000)	Sales, Operating Income, Net Income		
Banker, Potter, & Srinivasan (2000)	Revenue, Operating Expenses, Operating Income		
Yeung, Ging, and Ennew (2002)	Operating Income, Net Income		
Park & Kim (2003)	Market Share		
Kim (2006)	Profit		
Kim & Hwang (2006)	Sales		
Anderson, Fornell, & Mazvancheryl (2004)		Tobin's q, MBE[e]	
Gruca & Rego (2005)		Cash Flow, Cash Flow Volatility	
Fornell et al. (2006)		MVE[b]	
Mittal et al. (2005)		Tobin's q	Stock Returns
Yi & Lee (2006)	ROA	EVA[c]	
Aksoy et al. (2008)	ROA, ROE	MBA[d], MBE[e]	PE[f]
Yi, Cha, & Lee (2008)	ROA	EVA[c]	
Anderson & Mansi (2009)		Credit Ratings, Cost of Debt	
Ittner et al. (2009)	Revenue, Profit margin, ROA		
Rego et al.(2013)	Market Share		
Jacobson & Mizik (2009)			Risk-Free Returns
O'Sullivan et al. (2009)			Stock Prices
Tuli & Bharadwaj (2009)			Systematic/ Idiosyncratic Risk
Raithel et al. (2012)			Stock Returns
Grewal et al. (2010)		Tobin's q	
Larivière et al. (2016)		Tobin's q	
This study	Revenue Net Income	Tobin's q	Stock Returns

Notes: [a] Noninterest expenses as a percentage of total revenues
[b] The market value of equity
[c] Economic value added
[d] The ratio of the market value of equity to the book value of assets
[e] The ratio of the market value of equity to the book value of equity
[f] The price-earnings ratio

Ⅲ. Hypotheses Development

As we have presented, it has been well documented that the level of CS affects firm performance. However, considering the distributional aspects of CS can potentially lead to new insights in understanding the relationship between CS and firm performance. That is, it is worthwhile to ask: how does the variance of CS affect conventional performance measures (e.g., revenue and profit)? We hypothesize two types of effects: a main effect and a moderating effect. First, the variance of CS may directly affect top-line or bottom-line performance given the same level of average CS. If the variance of CS increases, then there arises a wide variety of customers at the satisfaction spectrum. High-end satisfaction can lead to customer delight (Chandler 1989; Schneider & Bowen 1999; Arnold et al. 2005), which in turn can bring about positive behaviors such as continuous repurchases or favorable word-of-mouth (WOM) communication (Oliver, Rust, & Varki 1997). At the low end of the spectrum, customers are likely to show negative behaviors such as terminating contracts or spreading unfavorable comments in the social networks (Chitturi et al. 2008; Goldenberg et al. 2007).

If these positive and negative customer responses cancel out each other, then the variance of CS would not affect firm performance. However as well documented in the literature, the customer's perceived value depends upon her expectation, and loss looms larger than gain (Kahneman & Tversky 1979). That is, dissatisfied customers disproportionately feel value loss and engage in more negative WOM than the positive stories happy customers distribute (Anderson 1998), and such negative WOM communication by unsatisfied customers is likely to have negative effects on firm performance (Richins 1987; Gerlsbeck 2006). Moreover, dissatisfied customers tend to incur additional costs (Harmon and McKenna-Harmon 1994), and serving heterogeneous customers is more costly (Grewal et al. 2010). Due to this asymmetry between satisfied versus dissatisfied customers, several studies have reported non-linear relationship between customer satisfaction and firm performance measures. Jones & Sasser (1995) noted that depending upon competitive environments, the relationship between CS and loyalty shows deferent patterns, mostly non-linear. Keiningham et al. (2003) found a positive and non-linear relationship between CS and the share of wallet. It has been also suggested an S-shaped relationship between CS and firm performance (Ittner & Larcker 1998; Homburg et al. 2005).

In this regard, we propose the following hypotheses:

H1a: The variance of CS has a negative relationship with financial performance. That is, the higher the variance of CS, the lower the firm's sales and profit-

ability are.

We can also hypothesize the moderating role of CS variance on the relationship between the level of CS and firm performance. More specifically, if a firm keeps a wide range of customers in terms of satisfaction, then changes in the average level of CS cannot be directly translated to aggregate customer responses such as sales revenue, resulting in weaker relationship between CS and firm performance. Conversely, if the firm spends significant amount of financial resources to accommodate the request of dissatisfied customers, the relationship between CS and profit might be even negative, i.e., the higher the level of CS, the lower the profitability. This is a similar reasoning why quality should be optimized rather than maximized (Rust, Zahorik, & Keiningham 1995). However, the relationship between CS and financial performance may be more pronounced for a low variance of CS where most customers show similar satisfaction levels. Therefore, the following hypothesis can be developed:

H1b: The variance of CS moderates the relationship between the average level of CS and financial performance. That is, firms with a low variance of CS show a stronger relationship between the average level of CS and financial performance than those with a high variance of CS.

As discussed earlier, a firm's financial performance is a backward-looking indicator of its current situation, and thus, it is relevant to the firm's future performance only in the near term. On the other hand, firm value – as is typically measured by the market value of equity – is a forward-looking indicator and thus serves as a measure of investors' valuation of firms' long-term prospects. Various factors may be used as value-relevant information by investors, and the level of customer satisfaction is found to be an important factor to explain the market value of equity (Anderson, Fornell, & Mazvancheryl 2004). Given the same level of CS, what happens to firm value if CS shows higher variance? We expect the following two possibilities to be plausible, albeit not necessarily with the equal likelihood. On one hand, higher CS variance can negatively influence firm value due to the following reasons. First, negative WOM communication by dissatisfied customers may deteriorate firm value directly through investors' negative perceptions, since the investors are also exposed to unfavorable signals (e.g., blog posts, news articles) from dissatisfied customers. This is analogous to the direct route of advertising in increasing firm value suggested by Joshi & Hanssens (2010). Second, since the high variance of CS brings high uncertainty in terms of customer responses and thus financial performance such as revenue and profit, investors perceive higher uncertainty about the future cash flows of such firms. This

uncertainty can play a role as an additional discount factor, resulting in lower firm value.

On the other hand, under certain scenarios, the CS variance can increase firm value. One such scenario is that the variance of CS represents, or is positively correlated with, heterogeneity among stock-market investors facing short-sale constraints. Finance theory has established that such constraints on short sales, together with investor heterogeneity, can induce the overvaluation of stocks and thus lead to a higher Tobin's q ratio (e.g., Miller 1977; Jones & Lamont 2002). An alternative scenario is that the relation between CS and firm value is convex. What this means is that extreme satisfaction adds to firm value more than extreme dissatisfaction undermines firm value. Consequently, large dispersion in CS can be positively related to Tobin's q ratio. The finance literature has also recognized this possibility and use this notion to explain the positive relation between firm uncertainty and firm value (e.g., Pastor & Veronesi 2003). Therefore, we propose the following open-end hypothesis:

H2a: The variance of CS can have either a positive or a negative relationship with firm value in the stock market. That is, it is an empirical question.

As in the relationship between the level of CS and financial performance, the variance of CS is also expected to play a moderating role on the relationship between the level of CS and firm value. Several previous works have demonstrated the positive relationship between customer satisfaction and firm value (e.g., Gruca & Rego 2005), but we conjecture that this relationship will be attenuated by the variance of CS. If a firm has a wide range of customers in terms of the level of satisfaction, as the average of CS increased, the convexity between CS and firm value may increase and thus the larger dispersion in CS can amplify the average CS effect. Alternatively, with large variance in CS, the average CS may not contribute to firm value. For example, if customer loyalty is an S-shaped function of CS and customers' CS levels are dispersed widely, the net change in aggregate customer loyalty due to the change of CS average may be negligible because of the flat – either high or low – ranges where CS level changes would not be translated to significant changes in consumer behavior. In this regard, we also hypothesize a moderating effect of CS variance on the CS-value relationship such that:

H2b: The variance of CS moderates the relationship between the average level of CS and firm value. That is, firms with a low variance of CS show a stronger relationship between the average level of CS and firm value than those a high variance of CS.

Finally, the variance of CS may influence stock returns. According to the efficient market hypothesis (Fama 1970), no stock can earn an abnormal or excessive return because the stock market immediately incorporates all relevant information into stock prices. However, unlike the average level of CS, the variance of CS is not publicly announced. That is, the information contained in the variance of CS may take some time to reach investors. Thus, an abnormal stock return can accrue over some time. Also, the variance of CS may contain the information that is complementary to the information contents of the average CS level. More specifically, the stock price implication of the average CS level can be clearer when the accompanying variance information is additionally available, and vice versa. Thus, as the variance information is gradually known to investors, the effect of the average CS level on stock price can be affected as well, thereby leading to an abnormal stock return.

In this regard, we propose the following hypotheses:

H3a: The variance of CS has a negative relationship with the firm's abnormal stock returns. That is, the higher the variance of CS, the lower the firm's abnormal stock returns are.

H3b: The variance of CS moderates the relationship between the average level of CS and the firm's abnormal stock returns. That is, firms with a low variance of CS show a stronger relationship between the average level of CS and stock returns than those with a high variance of CS.

Ⅳ. Methodology

4.1 Data

We employed three data sets. Regarding the first data set, we obtained the data for our key variable, namely the mean and variance of CS, from the National Customer Satisfaction Index (NCSI)[1], which provides 10 years of time series data for the 1998-2007 period. The Korea Productivity Center (KPC) collects the NCSI data by following the exact procedure for the American Customer Satisfaction Index (ACSI). The detailed ACSI methodology, which has been examined in numerous studies, can be found in Fornell et al. (1996). The NCSI is constructed based on a quarterly survey in which a given firm is covered once a year. We selected 62 firms in 24 industries as a sample for this

1) The NCSI is methodologically equivalent to the American Customer Satisfaction Index (ACSI) and has been compiled in Korea since 1998.

study after excluding unlisted firms in the Korean stock market. If a firm has multiple products/services included in the NCSI survey, we selected a major product based on the size of revenue to select a representative CS score for the particular firm. The mean score of CS is usually announced as an NCSI score while the variance of CS is not public information. There are significant over-time and across-company differences in the variance of CS as the coefficient of variation is 24.6%, and the range is 16.1 in our observation. Table 2 shows the industries and the number of firms included in the current study.

The second data set was for financial performance and firm value. We obtained the data from the KIS Value database (compiled by the National Information and Credit Evaluation in Korea). The variables for financial performance included sales and net income,[2] each of which was divided by total assets to control for the effect of firm size. We selected Tobin's q (Tobin 1969) to measure firm value. Tobin's q gauges a firm's market value with respect to its replacement cost. Because of the simplicity and clarity of its calculation and meaning, Tobin's q has been widely used for investigating the relationship between firm value and various firm characteristics (e.g., Mittal et al. 2005).

The third data set included data on stock returns from the Korean Capital Market Institute. The data were of monthly frequency and spanned from 1998 to 2007. We adjusted the data for dividends (including cash dividends) and splits. Table 3 reports the descriptive statistics for the variables and their bivariate correlation matrix.

〈Table 2〉 Industries and firms Considered in the Study

Industry	Number of Firms	NCSI[a] Release Quarter
Airlines	2	1st
International Telephone Services	2	1st
Mobile Telephone Services	3	1st
Broadband Internet Services	1	1st
Personal Computers	1	2nd
Mobile Phones	4	2nd
Televisions	1	2nd
Automobiles	2	2nd
Apartment Construction	7	2nd
Milk and Dairy Products	3	3rd
Soju (Korean Wine)	2	3rd
Beer	1	3rd
Beverages	2	3rd
Tobacco	1	3rd
Men's Suits	3	3rd
Women's Fragrance and Beauty Products	4	3rd
Gas Stations	2	4th
Department Stores	2	4th
Discount Stores	1	4th
Hotels	1	4th
Banks	5	4th
Credit Cards	3	4th
Property Insurance	4	4th
Securities	5	4th
Total (24 industries)	62	

Notes: [a] National Customer Satisfaction Index survey results are released every quarter of a year.

2) Although we analyzed operating income, we do not report the results because they are similar to those for net income.

〈Table〉 3 Descriptive Statistics for Variables and a Bivariate Correlation Matrix

	Mean	Standard Deviation	Correlation Matrix					
			Sales/ Total Assets	Net Income/ Total Assets	Tobin's q	Stock Return	Mean of CS	Variance of CS
Sales/ Total Assets	.905	.628	-					
Net Income/ Total Assets	.440	10.763	. 059**	-				
Tobin's q	1.070	.406	.043**	.036**	-			
Stock Return	.028	.191	-.006	-.025	-.043**	-		
Mean of CS	68.218	5.662	.188**	.150**	.146**	-.003	-	
Variance of CS	12.546	3.082	-.071**	-.128**	-.107**	.033*	-.606**	-

* $p < .05$, ** $p < .01$

4.2 Model

4.2.1 Variance of customer satisfaction and the financial performance and value of firms

To test Hypothesis 1, we estimated pooled regressions with firm-level fixed effects. Here the key independent variables were the mean level of customer satisfaction (*CSM*) and the variance of customer satisfaction (*CSV*), and the dependent variable was financial performance. To control for any persistence in financial performance (Lev 1983; Collins & Kothari 1989), we included a lagged dependent variable as an independent variable.[3] In addition, we included firm fixed effects in the regressions to control for the heterogeneity of the sample firms,[4] and other control variables (*CTRL*) such as real GDP or deterministic trend that may affect the firm's financial performance. That is, we modeled the financial performance of firm i at time t as follows:

$$(1)\quad SOA_{it} = \alpha_{1i} + \beta_{11}CSM_{it} + \beta_{12}CSV_{it} + \beta_{13}CSM_{it}CSV_{it} + \lambda_1 SOA_{i(t-1)} + \gamma_1 CTRL_t + \varepsilon_{1it},$$

3) We also included additional lagged dependent variables in each model but found no difference in the direction of focal estimates from those of the proposed models.

4) The results of Hausman test and likelihood ratio test confirm our choice of fixed effects model. The details of the test results are available from the authors upon request.

(2) $$NIOA_{it} = \alpha_{2i} + \beta_{21}CSM_{it} + \beta_{22}CSV_{it} + \beta_{23}CSM_{it}CSV_{it} + \lambda_2 NIOA_{i(t-1)} + \gamma_{21}SOA_{it} + \gamma_2 CTRL_t + \varepsilon_{2it},$$

where SOA_{it} denotes the ratio of sales to total assets for firm i at time t; $NIOA_{it}$ denotes the ratio of net income to total assets; the significance of β_{12} and β_{22} tests the main effect of the variance of CS; and the significance of β_{13} and β_{23} reflects the moderating effect of the variance of CS.

To test Hypothesis 2, we employed Tobin's q (*TOBQ*), our proxy for firm value, as a dependent variable in panel regressions (see Equation 3). In this specification, we also included the measures of financial performance (i.e., sales and profit) as independent variables because they are known to influence firm value (Ohlson 1995; Pauwels et al. 2004). We employed the coefficients β_{32} and β_{33} to test the main and moderating effects of the variance of CS on firm value.

(3) $$TOBQ_{it} = \alpha_{3i} + \beta_{31}CSM_{it} + \beta_{32}CSV_{it} + \beta_{33}CSM_{it}CSV_{it} + \lambda_3 TOBQ_{i(t-1)} + \gamma_{31}SOA_{it} + \gamma_{32}NIOA_{it} + \gamma_3 CTRL_t + \varepsilon_{3it}$$

4.2.2 Variance of customer satisfaction and stock returns

Some of the stock return is attributable to the reward for taking risks (i.e., risk premium). Thus, to correctly gauge the effect of CS (its variance in particular), we examined the risk-adjusted stock return. For this, we employed Fama and French's (1993) three-factor model.[5] Specifically, we estimated the following regression for each stock:

(4) $$RET_{st} = b_{s0} + b_{s1}MKT_t + b_{s2}SMB_t + b_{s3}HML_t + \varepsilon_{st},$$

where *MKT*, *SMB*, and *HML* indicate market-, firm size-, and valuation-related risk factors, respectively. We constructed these factor-mimicking portfolios by following Fama and French (1993). In addition, RET_{st} is the return on portfolio s at time t sorted by the level and variance of customer satisfaction (detailed below), and the intercept b_{s0} is the average return on the portfolio for the estimation period that is unrelated to the three risk factors, that is, the abnormal return for that portfolio for the estimation period.

We constructed these portfolios by first using the average level of CS and then employing its variance. Specifically, by the median level of

5) Previous studies have documented no momentum profit in the Korean stock market (e.g., Rouwenhorst 1999; Chui, Titman, & Wei 2000; Hameed & Kusnadi 2002). Thus, we did not include a momentum factor in the model.

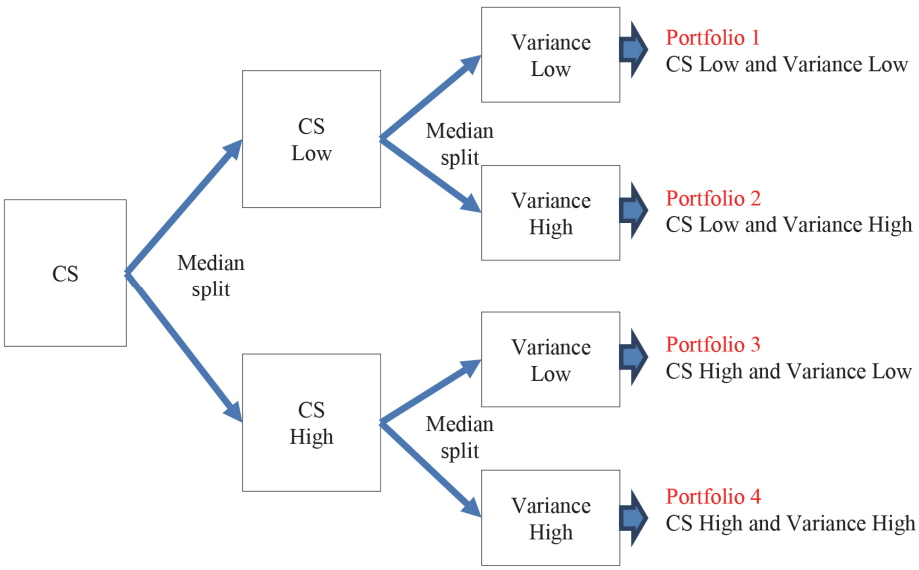
CS calculated for each quarter, we divided the sample firms into two groups. For each group, we further divided firms into two subgroups by the median variance of CS. Figure 1 describes this procedure. Portfolio 1 included firms with a low average level of CS and a low variance of CS, and Portfolio 2 included those with a low average level of CS and a high variance of CS. Portfolios 3 and 4 included firms with a high average level of CS. However, Portfolio 3 reflected a low variance of CS, whereas Portfolio 4, a high variance of CS. As in Aksoy et al. (2008), these portfolios are rebalanced each quarter when new NCSI data are released. Therefore, a firm may stay in one portfolio or switch among different portfolios depending upon its changes in the level and variance of CS during the observation period. The monthly value-weighted portfolio returns are used to test the relationship between abnormal stock returns and customer satisfaction.

4.3 Results

4.3.1 Variance of Customer Satisfaction and the Financial Performance of Firms

We estimated equations 1 through 3 by ordinary least squares with firm fixed effects using PROC SURVEYREG in SAS 9.2 to use the White standard error allowed to cluster within a given firm for the correlation structure. All models show significant F statistics, and no significant serial correlations are found in Durbin-h statistics as shown in Table 4. The variance

〈Figure 1〉 Portfolio Composition Method



of CS is found to have significant relationships with firm performance. Consistent with H1a, the variance of CS is negatively related to sales, i.e., other things being equal, the higher the CS variance, the lower the expected sales. In addition, the variance of CS moderates the relationship between the average level of CS and sales (H1b). That is, an increase in the variance of CS reduces the strength of the relationship (toward no relationship). These results suggest that the average level of CS and financial performance may show no significant relationship if the variance effect is not controlled for and thus that the variance of CS should be taken into account when evaluating CS as a driver for firm performance.

However, the results indicate no such effects on net income. These results may be due to differences in the CS management strategy between firms. For example, if a firm achieves meaningful financial results by focusing only on a group of satisfied customers, then the variance of CS may not reduce the firm's overall profitability. However, if a firm (ineffectively) deploys extra marketing resources to prevent dissatisfied customers from churning or engaging in negative WOM communication, then the firm's profitability may be reduced by the variance of CS. The insignificant main and moderating effects of the variance of CS on profitability may be due to these differences in marketing practices, although future research should verify this conjecture.

Noteworthy is that the main effect of the average level of CS on sales (which we did not explicitly hypothesize about) was significant at the 10% level, which is consistent with the findings of Fornell (1992; 1995). These results

〈Table 4〉 Variance of Customer Satisfaction and firm's Financial Performance Value

Independent Variables	Dependent Variables								
	Sales			Net Income			Tobin's q		
	Parameter	t-stat	*p*-value	Parameter	t-stat	*p*-value	Parameter	t-stat	*p*-value
CS	-.034	-1.85	.065	.007	.80	.422	.028	1.82	.070
Variance of CS	-.149	-1.96	.051	.018	.50	.617	.132	2.04	.043
CS*Variance of CS	.002	1.98	.049	-.000	-.47	.641	-.002	-1.95	.053
Lagged DV	.520	11.42	.000	-.038	-.73	.465	.499	11.89	.000
Sales				-.007	-.31	.757	.098	2.64	.009
Net Income							.349	2.45	.015
GDP	.000	-.44	.661	.000	1.11	.266	.000	2.96	.003
Trend	.005	.14	.885	-.015	-.970	.333	-.043	-1.59	.114
R-squared		.847			.280			.816	
Durbin-h Statistics		-.448			-.505			.526	
# of observations		438			430			383	

have interesting managerial implications, that is, it is not easy to improve both CS and a customer base simultaneously.

4.3.2 Customer Satisfaction and Firm Value

The variance of CS has a significant relationship with firm value. However, although the variance of CS has a negative moderating effect on firm value (as expected in H2b), it has a positive main effect on firm value. Because this relationship is found after the effects of the average level of CS, sales, profitability, and the inertia of firm value were controlled for, it reflects the incremental or direct effect of the variance of CS on firm value. This positive relationship between the variance of CS and firm value suggests that the stock market may overvalue firms with a high variance of CS. As a matter of fact in finance academia, it is well documented that constraints on short sales, together with investor heterogeneity, can induce the overvaluation of stocks. Because Tobin's q is based on the stock price, positive opinions from satisfied customers are more likely to be reflected in stock prices than negative opinions (Miller 1977; Jones and Lamont 2002). We conjecture this 'short-sale constraint' as an explanation of our finding about the relationship between the variance of CS and firm value.

As expected in H2b, the variance of CS moderated the relationship between the average level of CS and firm value in the opposite direction. That is, firms with a high variance of CS were more likely to show a weak relationship between the average level of CS and firm value than those with a low variance of CS. These results clearly suggest the importance of controlling for the variance of CS for an accurate understanding of the relationship between CS and firm value.

4.3.3 Customer Satisfaction and Stock Returns

We compared the average stock returns of the four test portfolios (Table 5). Portfolio 3 (a high average level of CS and a low variance of CS) show the highest average return, followed by Portfolio 1 (a low average level of CS and a low variance of CS), Portfolio 4 (a high average level of CS and a high variance of CS), and Portfolio 2 (a low average level of CS and a high variance of CS), in that order. We also interpreted these results by holding the average level of CS constant and comparing two portfolios with different variance values and vice versa. The results indicate a larger difference in the average stock return between portfolios that are different in terms of the variance of CS but similar in terms of the average level of CS (Portfolio 1 vs. Portfolio 2, p = .056; Portfolio 3 vs. Portfolio 4, p = .068) than between those that were different in terms of the average level but similar in terms of the

〈Table 5〉 Stock Returns by Portfolio

		Customer Satisfaction		Stock Returns	
	N	Mean	Variance	Mean	Standard deviation
Portfolio 1	1,183	Low	Low	.033	.191
Portfolio 2	1,244	Low	High	.017	.214
Portfolio 3	1,006	High	Low	.034	.179
Portfolio 4	729	High	High	.018	.193

variance (Portfolio 1 vs. Portfolio 3, p = .912; Portfolio 2 vs. Portfolio 4, p = .920). This provides support for Hypothesis 3a, which predicted that the variance of CS would influence stock returns regardless of the average level of CS.

Table 6 shows the estimation results for Fama-French's three-factor model. First of all, the results provide support for the main effect of the average level of CS found in previous studies. That is, Portfolios 3 and 4 combined (a high average level of CS) show a significant intercept term (.015, p = .029). The results (Panel A in Table 6) provide support for H3a, which predicts a main effect of the variance of CS on stock returns. That is, Portfolios 1 and 3 (a low variance of CS) show a significant intercept term (.013, p = .008). This implies that, regardless of the average level of CS, those portfolios reflecting a low variance of CS (that is, a small difference in CS among customers) achieve significant excess returns.

To test the moderating effect of the variance of CS (H3b), we examined the four portfolios based on the average level of CS and the variance of CS (Panel B in Table 6). Portfolio 3 (a low variance of CS and a high average level of CS) shows a positive and significant intercept term (.019, p = .025), but Portfolio 4 (a high variance of CS) shows an insignificant intercept (p = .225), providing support for H3b. In addition, for Portfolios 1 and 2 (a low average level of CS), the sufficient condition for a positive and significant intercept term is found to be a low variance of CS. That is, only Portfolio 1 has a positive and significant intercept term (.012, p = .053). Figure 2 compares the intercept estimates for the four portfolios.

4.3.4 Validation and Additional Analysis

1) Model specification.

We checked the robustness of our model results by incorporating other model specifications. First, we included additional lagged dependent variables (up to lag 2) in equations 1 through 3 but found no difference in the direction of focal estimates from those of the proposed models. Second, instead of OLS with firm fixed effects, we estimated a dynamic panel model with first differencing (Arellano and Bond 1991).

〈Table 6〉 Three-Factor Model Estimation Results

Model: $RET_{st} = b_{s0} + b_{s1}MKT_t + b_{s2}SMB_t + b_{s3}HML_t + \varepsilon_{st}$,

where *MKT*, *SMB*, and *HML* indicate market-, firm size-, and valuation-related risk factors, respectively.

Main Effects

Variance of CS is low (Portfolio 1 + 3)			Mean of CS is high (Portfolio 3 + 4)		
Variables	Estimates	*p*-value	Variables	Estimates	*p*-value
Intercept	.013***	.008	Intercept	.015**	.029
MKT	1.201***	.000	MKT	1.064***	.000
SMB	.413***	.000	SMB	.531***	.000
HML	.280***	.001	HML	.112	.323

n=2952, n=2679

Moderating Effects

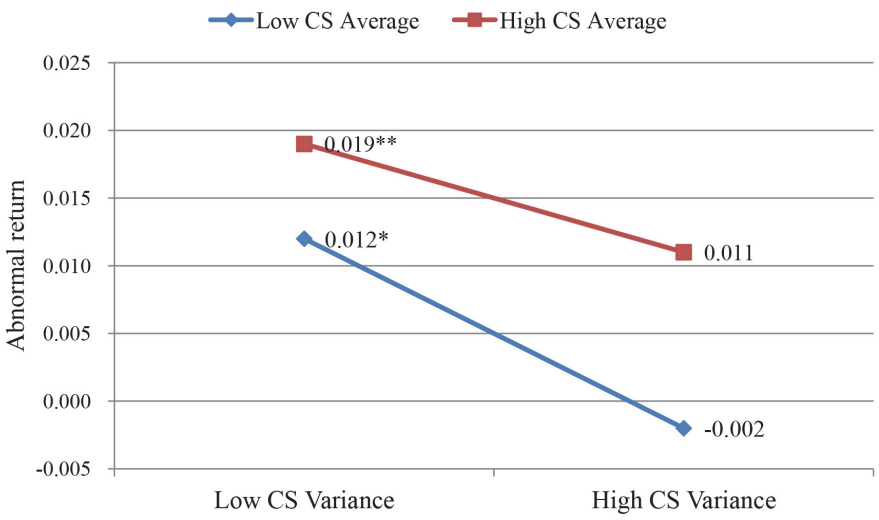
		Mean of Customer Satisfaction					
		Low			High		
Variance of Customer Satisfaction	Low	[Portfolio 1]			[Portfolio 2]		
		Variables	Estimates	*p*-value	Variables	Estimates	*p*-value
		Intercept	.012*	.053	Intercept	.019**	.025
		MKT	1.253***	.000	MKT	1.220***	.000
		SMB	.438***	.000	SMB	.526***	.000
		HML	.247**	.017	HML	.287**	.038
	High	[Portfolio 3]			[Portfolio 4]		
		Variables	Estimates	*p*-value	Variables	Estimates	*p*-value
		Intercept	-.002	.806	Intercept	.011	.225
		MKT	1.153***	.000	MKT	.947***	.000
		SMB	.233*	.072	SMB	.441***	.001
		HML	.113	.423	HML	-.158	.266

n(portfolio 1) = 954, n(portfolio 2) =1997, n(portfolio 3) = 2062, n(portfolio 4) = 681,
* $p < .10$, ** $p < .05$, *** $p < .01$

Since there exists endogeneity for lagged dependent variables in this model specification (see also Tuli and Bharadwaj 2009), we applied dependent variables of lag 2 to 4 as instrumental variables in GMM estimation. Again we found no difference in the significance and direction of focal estimates.[6)]

6) The GMM estimation results are omitted to save space, but available from the authors upon request.

〈Figure 2〉 Comparison of Intercept Estimates for Portforlio



* $p < .10$, ** $p < .05$, *** $p < .01$

2) Across industry analysis

To see if there is a difference of the results among industries, we compared our main results between (1) services versus manufacturing and (2) information technology versus others. More specifically, we added an industry dummy variable representing the manufacturing (or IT) industry into equations 1 to 3 to check whether there is interaction between this industry dummy variable and our main results. To check the abnormal stock returns, we constructed industry-specific portfolios to compare with the aggregate-level results. We found no difference in these industry- level analyses. All the interaction terms in equations 1 to 3 are insignificant, and the variance of CS plays an important role in creating abnormal returns in industry-specific portfolios. This analysis confirms that our main results are consistent across industries.

3) Asymmetry of CS distribution

The negative relationship between the variance of customer satisfaction and firm performance should be interpreted with caution. It does not mean that maintaining all customers' CS level around average always yields better performance, which is inconsistent with "customer delight" or "20:80" rule. Therefore, other metrics that show asymmetry of CS distribution, e.g., skewness or range, need to be examined. We constructed a new portfolio based on the skewness and variance of CS to investigate the role of asymmetry of CS distribution. As in the main analysis, the portfolio was formed according to the median level of CS skewness and

variance, and was rebalanced every year. As a result, regardless of skewness, portfolios with low variance revealed significantly higher abnormal return ($p < .05$). However, we also found that the negative relationship between CS variance and abnormal return becomes weaker when the skewness of CS is higher, i.e., more customers are located in the right hand side of tail of the CS distribution. More specifically, the difference of the constant term (.012 - .007 = .005) between low versus high variance groups when skewness is high is significantly lower than the same corresponding difference (.022 - .005 = .017) when skewness is low ($p < .05$). It can be inferred that if there are sufficient number of delighted customers, the negative effect of CS variance on firm performance may vanish. However, this issue merits more careful consideration using other distributional metrics such as deciles and range, or more ideally using an individual-level CS distribution dataset.

V. Conclusion

Marketing managers and scholars have focused on CS as a leading indicator of firm performance. In this regard, this study sheds some light on our understanding of the relationship between CS and firm performance by investigating the role of the distribution (variance in particular) of CS in the relationship. As expected, the variance of CS is found to be important in explaining various measures of firm performance and firm value. Our main results are summarized as follows:

First, the results provide support for the findings of previous studies suggesting that the level of CS is an important variable for explaining various measures of financial performance, including sales, profitability, firm value, and stock returns. Second (and more importantly), the variance of CS has a main effect on various measures of firm performance. The results of our empirical analysis indicate that sales, firm value, and stock returns has significant relationships with the variance of CS. More specifically, the variance of CS is negatively correlated with stock returns, which may be due to the positive correlation between the variance of CS and firm value. In this regard, future research should determine whether this positive correlation is due to systematic bias. Third, the variance of CS has a significant moderating effect on the relationship between CS and firm value, indicating that it should be an important moderating variable in any analysis of CS as an indicator of firm value. The results indicate that an increase in the variance of CS reduces the significance of the relationship between CS and firm performance for all three measures, including financial performance, firm value, and stock returns.

These results suggest that an increase in firm performance and thus firm value requires

not only an increase in the average level of CS but also a decrease in the variance of CS among customers. Although many firms consider the level of CS as a key performance indicator, the variance of CS tends to be ignored. Managers should listen more to customer complaints and focus on recovery of service or product failure to help reduce the variance of satisfaction levels across customers. These attempts would be as important as focusing on only loyal customers and enhancing the overall level of CS.

This study has some limitations that require further investigation. First, although there exist other metrics that govern the distribution of a variable (e.g., skewness, kurtosis, maximum, minimum, and median), we focused on the role of the variance of CS. In this regard, a more in-depth analysis based on a multidimensional approach is needed for a more comprehensive understanding of the effects of the distribution of CS on firm performance. Second, we did not investigate the determinants of main and moderating effects of the variance of CS. For example, the position of a particular firm in an industry or an industry's characteristics may determine the variance of CS and thus influence financial performance. Third, we analyzed the variance of CS and the average level of CS, but there may exist the variance of firm performance as well. In this regard, future research should examine the relationship between the variance of firm performance and that of CS. For example, there may be some volatility associated with firm value, and thus, the variance of CS may influence not only stock returns but also such risks (Tuli and Bharadwaj 2009).

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