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Recent research studies have shown that, in the aggregate, survey participation is associated with increased purchase behaviors. Whereas selective customer response could be responsible for some of this correlation, we conclude that survey participation does cause changes in purchase behavior. On the basis of this conclusion, we investigate the possible differential impact of participating in a firm-sponsored satisfaction survey on (1) services purchases, (2) responsiveness to promotions, (3) interpurchase time, and (4) spending, across customers. We develop a joint model of these four customer behaviors and explicitly examine the role of customer characteristics and store-specific variables in moderating the effects of survey participation. We also study how these effects change over time.

The data used for the analysis come from a longitudinal field study of customer satisfaction conducted by a U.S. automotive services firm. It contains two groups of customers. One group was administered a customer satisfaction survey and the other was not. Our results reveal a substantial positive relationship between satisfaction survey participation and all the customer behaviors studied. Assuming a causal relationship, we also find the effects of satisfaction survey participation to vary across customers and stores, and over time.

Key words: survey research; customer behavior; mere measurement effect; survey participation effect; hierarchical Bayes; Conway-Maxwell-Poisson
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1. Introduction and Research Motivation

Professional marketing researchers tend to think of their work as primarily eliciting customer opinions and as separate from influencing customer opinions or behaviors. Yet a growing number of research studies reveal that such a distinction is, for the most part, an artificial one. They show that even when survey research is conducted without any overt intent to influence customers, it is still associated with significant and broad-based changes in customers' behaviors regarding the firm.

Research on this issue can be traced to the findings on the mere measurement effect, which revealed that simply asking customers their purchase intentions can significantly change their subsequent purchase behaviors in product categories such as cars and personal computers (Morwitz et al. 1993).

More recently, Dholakia and Morwitz (2002; D&M henceforth) extended this finding to firm-sponsored satisfaction surveys. They conducted a field study of U.S. financial services customers participating in a firm-sponsored telephone-based satisfaction survey, and found that surveyed customers opened significantly more accounts after the survey, were more profitable, and had lower defection rates when

compared to a control group of similar customers who had not participated in the survey. The intergroup differences in new account openings, profitability, and loyalty behaviors between the surveyed and the control groups were observable even up to a year after the survey.

Chandon et al. (2004; CMR henceforth) generalized these findings to online grocery purchases. They conducted their field study with customers of a French online grocer and found that customers who responded to three purchase intentions questions via a telephone survey sponsored by the firm made their first repeat purchase sooner, relative to similar non-participants, were more likely to make repeat purchases for up to three months postsurvey and were more profitable to the firm over the course of a nine-month period.[1]

Prior research has argued that such effects of survey participation occur for two reasons. One reason is that survey participation often induces respondents to form judgments regarding the sponsoring firm and its products or services that they otherwise would

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[1] It is worth noting here that in these research studies, the authors only provided correlational and logical evidence of causality. We discuss this issue in more detail in §5.

not have formed in the absence of survey questioning (Feldman and Lynch 1988). These measurement-induced judgments remain accessible in customers' memories, and influence their postsurvey behavior (Fitzsimons and Williams 2000, Morwitz and Fitzsimons 2004). A second reason is that the survey provides a useful source of information regarding the firm to many customers. It generates positive inferences regarding the firm's customer orientation and responsiveness, and it positively influences postsurvey behaviors (Dholakia et al. 2005). Recently, Janiszewski and Chandon (2007) argued that in addition to any effect that attitude accessibility might have, the effect of asking an intention question also serves to make the target behavior more perceptually fluent; this fluency contributes to the mere measurement effect.

From a practical standpoint, these findings are important, because they suggest that survey-based marketing research projects do not simply incur costs for the sake of gaining insights into customer sperceptions as is conventionally believed, but they might bring in additional revenues through such avenues as increased sales, reduced defection, and other positive behaviors by the respondents. At the same time, these studies also raise a host of interesting and important questions that still remain to be answered. Some of these questions that form the focus of this research are these: Do the effects of survey participation extend to customers' subsequent responsiveness to the firm's promotions? How are these effects affected by customer and store characteristics? How do these effects vary over time?

Our objective in this paper is to develop and estimate a joint customer behavior model to answer these questions. Such an analysis is important for several reasons: It enhances our understanding of the potential effects of survey participation on a firm's customers. The insights so obtained might allow for a more accurate accounting of the net cost (or gain) of individual customer satisfaction research projects, given a particular composition of respondents.[2]

In this paper, we consider two types of variables that might help uncover individual differences in susceptibility to survey participation influences: customer characteristics, and characteristics of the firm. First, attributes of the customers themselves could determine the extent to which they are susceptible to the influences of survey participation. We refer to these factors as *customer characteristics*. They include variables such as the customer's tenure with the firm and the age of his or her car, in addition to conventional demographic variables such as age, gender, household income, and household size.

Second, firm characteristics are also likely to play a role in how survey participation affects customers subsequently. Because the firm in our study is a national chain store providing automotive services, customers purchase products by visiting the firm's individual stores. Our data set and analysis are also at the individual service-visit level. Consequently, several store-level variables are included in our analysis, such as whether the store was company owned or franchisee owned, whether it had a customer lounge, the number of service bays in the store, and a measure of throughput times at the store.

Apart from these two types of variables (customer and store characteristics), we also investigate the likely effects of survey participation over time. That is, how long does it take for the survey participation effect to begin wearing off?[3] Finally, in addition to dependent measures related to purchase (number of services purchased, purchase frequency, and amount spent on each visit), we explicitly study the potential impact of survey participation on customers' subsequent promotion responsiveness (number of coupons redeemed).

Our analysis reveals a number of interesting factors that moderate the likely effects of survey participation on respondents. Some key findings follow: The household size, income, and newness of the customer's vehicle increase the potential impact. The customer's age as well as tenure with the firm diminishes this effect. The company-owned stores gain more (as compared to franchisee-owned stores) from the survey participation effect. We also investigate the time trend in potential impact of survey participation on the four behaviors and find that the likely impact on purchase frequency is much delayed when compared to the effects on other customer behaviors.

The rest of the paper is organized as follows. In §2, we introduce the data in more depth and then explain the model and discuss the results in §§3 and 4, respectively. Finally, in §5, we discuss the managerial implications of our findings along with some of the limitations of this study.

2. The Data

The data come from a large-scale survey, conducted by a leading U.S. automotive services firm, and cover the period from January 2001 to April 2003. This firm has an ongoing survey-based customer satisfaction tracking program; it randomly selects customers for participation in the survey within seven days of a service visit. Customers who participate in the survey do

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[2] However, this would require additional analysis not presented here.

[3] Although prior studies such as those of CMR and D&M have studied time effects on dependent variables, the analysis there was done at an aggregate level, analyzing each dependent variable separately.

not receive another survey for at least one year after their participation. Of all the customers who participated and responded to the satisfaction survey during the first quarter (January–March) of 2002, a random sample of 3,773 single-automobile[4] active[5] customers was drawn. In the discussion that follows, we refer to these customers as the *experimental group*. A second random sample of 1,227 single-automobile active customers, who had purchased service at least once during the first quarter of 2002 but were not surveyed by the firm, forms the control group. Thus, we use a total of 5,000 customers (3,773 experimental group and 1,227 control group) in our analysis. Due to the selection of the data sample as described, our conclusions from the study are valid for regular customers only.

The survey was conducted by telephone; it first identified the firm as the survey's sponsor, and then asked, among others, a question regarding the customer's overall satisfaction with the service visit.[6]

In the present study, the firm averaged contact response rates in the range of 90%–95% (i.e., 90%–95% of contacted people responded to the survey).[7] However, the firm did not collect data on how many of the customers chosen for the survey it was able to reach. Consultations with the market research vendor and experience with other such studies led us to believe that contact rates were between 60% and 70%, leading to a net response rate (i.e., percentage of chosen customers responding to the survey) between 54% and 67%.

We gathered detailed behavioral information for these 5,000 customers in our data sample from the firm's database for approximately a year prior to the survey period and a year afterward. This procedure yielded a data set with a total of 35,866 service visits or purchase occasions.

The data consist of four dependent measures of customer behavior: (1) the number of promotions redeemed by a customer on each visit (customers have access to the promotional coupons of the firm through multiple sources[8] and this variable captures the extent to which these promotions are redeemed by them); (2) the number of automotive services purchased on each visit (the firm provides various maintenance services such as brake service, transmission service, oil changes, etc.); (3) time since the last visit in days (interpurchase time); and (4) the amount spent during each visit.

Figure 1 provides histogram plots of these four dependent measures across the 35,866 service visits. Panels A and B in Figure 1 are histograms of the number of promotions redeemed and the number of services bought on each service visit, respectively, while panels C and D are histogram plots of the interpurchase times and the purchase amounts, respectively.
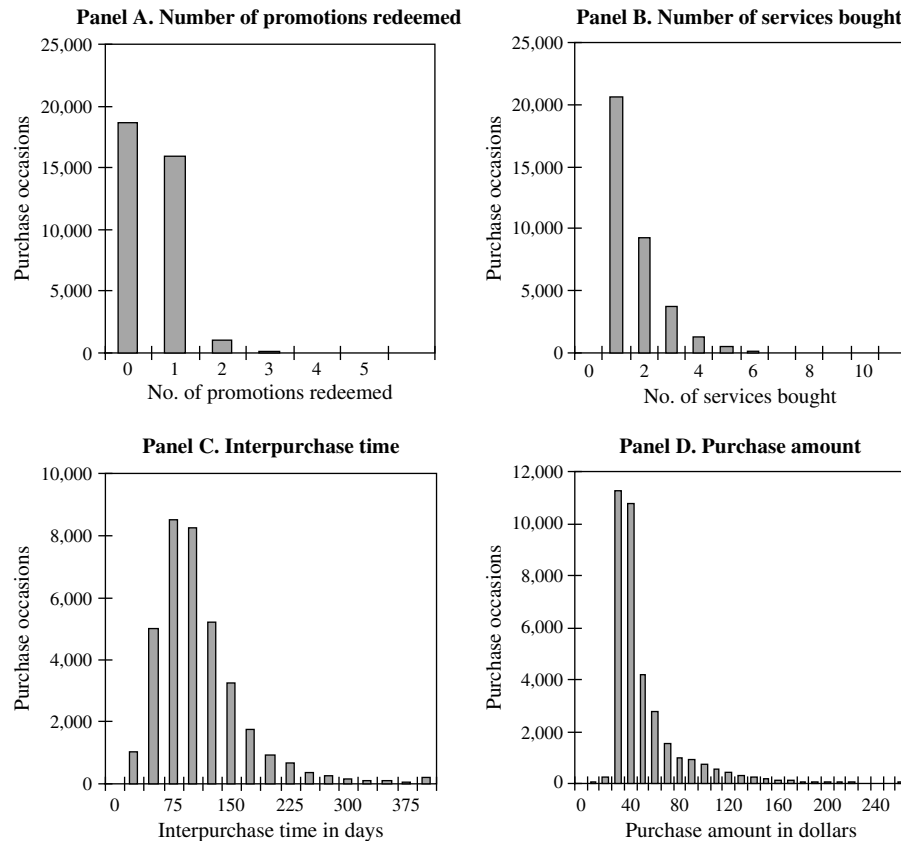
On a majority of the visits (52.1% of the visits) no promotions are redeemed; if promotions are redeemed, most of the time (44.4%) only a single promotion is redeemed. Multiple promotions are redeemed on fewer than 5% of the service visits. In other words, the variance in number of promotions redeemed across service visits is relatively low. On the other hand, the number of services bought on each occasion (panel B) shows a greater variance. Although a single service is purchased on a majority of the visits (57.5% occasions), buying multiple services is not uncommon; on about 16.4% of the visits, three or more different services were bought by the customer.

On average, the interpurchase time is 103 days, and the purchase amount on each visit is $42 for the sample (panels C and D in Figure 1). However, as seen in the plots, there is considerable heterogeneity in these measures.

Table 1(a) contains the summary statistics (mean and standard deviation) for these four dependent measures across four groups: the control group in the periods before and after the survey, and the experimental group before and after the survey.

Simple tests for differences in means across the groups do not indicate any significant differences between the control and experimental groups in the period prior to the survey on two of the four dependent measures (number of services bought and the purchase amount). For the remaining two dependent measures, there is a significant difference indicating that any modeling effort should control for these differences (which we do, as explained in §3).

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[4] We excluded multiple-automobile households from the analysis to prevent unknown factors from contaminating our results, e.g., the possibility that the person purchasing the service might not be the automobile's owner, that the patterns of intrahousehold communication influence the survey respondent, or other forms of interpersonal influence.

[5] We defined customers as active when they had at least one service visit during the period of the analysis (January 2001–April 2003), and if they had at least five service visits to the firm's stores during the seven-year period of January 1996 to December 2002, so all our analysis is restricted to the more regular customers of the firm.

[6] The surveyed customers indicated high satisfaction levels on this measure, with the average satisfaction score (on a 10-point scale) being 8.3 (s.d. = 1.9).

[7] Since this rate seemed high, we verified this by using data available to us from the last weeks of two recent quarters. We found response rates of 89.9% and 95.3% in these two time periods. This high response rate could be due to the nature of the product involved. Automobiles are high involvement products and expensive to maintain. They form an important part of a person's life, and hence customers might take more interest in the survey directly concerning their vehicle.

[8] Mails and reminder mails from the firm, joint promotions with partner firms, flyers, newspaper advertisements, online promotions, etc.

Figure 1   Histogram Plots of the Four Dependent Measures

Panel A. Number of promotions redeemed

Panel B. Number of services bought

Panel C. Interpurchase time

Panel D. Purchase amount

Tests[9] to infer the effect of survey done on this aggregate data yield positive survey effects in the interpurchase time behavior (i.e., the interpurchase time decreases postsurvey). However, the tests fail to detect any difference on the other three behaviors. This is at best a partial indication of the existence of the survey effect. The data are a combination of longitudinal and survey data. Thus, they are not generated by a laboratory experiment wherein the researcher can carefully control confounding effects. Therefore, to generate valid inferences, we need to use sophisticated individual level statistical models. This is what we attempt in setting up a model to make inferences from the available data. The model is introduced in §3.

Apart from these four dependent measures, the data also contained a host of customer and store-specific variables. Table 1(b) provides some summary statistics (mean and standard deviation) of the customer-specific variables across the two groups.

In the next section, we build a joint model for these four dependent measures and introduce customer characteristics and store-specific measures to study the differential impact of survey participation across

[9] The tests are *t*-tests for difference in means based on aggregate group data.

these four measures of customer behavior in depth. Using an individual-level model (as opposed to an aggregate model) becomes important because one of our goals is to also study the differential effects of survey participation across individuals and stores, based on various individual-specific and store-specific characteristics.

3. The Model

3.1. Model Structure
We develop a joint model of the number of promotions redeemed ($PROM_{ht}$), the number of services bought ($SERV_{ht}$), the time since last purchase

Table 1(a)   Summary Statistics

	Control group		Experimental group	
	Time period before survey	Time period after survey	Before survey	After survey
No. of promotions redeemed	0.48 (0.4358)	0.49 (0.5138)	0.52 (0.4237)	0.55 (0.4666)
No. of services bought	1.63 (0.6365)	1.71 (0.7737)	1.66 (0.6365)	1.73 (0.7271)
Interpurchase time (days)	98.07 (79.08)	95.54 (37.79)	107.47 (58.10)	102.56 (48.84)
Purchase amount ($)	40.38 (16.21)	43.92 (19.96)	41.39 (16.27)	44.54 (20.41)

Table 1(b)   Summary Statistics (Customer Characteristics)*

Customer characteristics	Control group	Experimental group
Gender (proportion of males)	0.62 (0.4865)	0.61 (0.4882)
Age (years)	36.5 (5.60)	36.4 (5.26)
Tenure (number of times customer bought from the firm in the time period prior to survey)	8.0 (5.79)	6.9 (5.17)
Year (year of manufacture of the vehicle)	1996 (3.44)	1996 (3.51)
Median household income ($)	62,210 (30,896)	64,415 (29,016)
Household size	2.6 (0.52)	2.7 (0.47)

*The variables "Age," "Median household income," and "Household size" have been estimated from the *Block Demographic Trends* available for the area of residence of the household.

($TIME_{ht}$), and the dollar amount spent ($AMNT_{ht}$) by customer h on purchase occasion t. The approach followed in building the joint model is to impose distributional assumptions on each of these four dependent variables and then allow a correlation structure across the four distributions.

The distributional assumptions are as follows:

$$PROM_{ht} \sim CMP(\lambda_{1ht}, \nu_1), \qquad (1)$$

$$SERV_{ht} \sim CMP(\lambda_{2ht}, \nu_2), \qquad (2)$$

$$\log TIME_{ht} \sim Normal(\lambda_{3ht}, \nu_3), \qquad (3)$$

$$\log AMNT_{ht} \sim Normal(\lambda_{4ht}, \nu_4). \qquad (4)$$

$PROM_{ht}$ and $SERV_{ht}$ (Equations (1) and (2)) are modeled as a COM-Poisson (Conway-Maxwell-Poisson, CMP) process (Conway and Maxwell 1961).[10] The COM-Poisson is a generalization of the Poisson distribution with an extra parameter ν that governs decay. The probability mass function of this distribution is as follows:

$$P_z(\lambda, \nu) = \left[\sum_{k=0}^{\infty} \frac{\lambda^k}{(k!)^\nu} \right]^{-1} \frac{\lambda^z}{(z!)^\nu}, \quad z = 0, 1, \dots \quad (5)$$

It is a distribution with thicker or thinner tails than the Poisson (Boatwright et al. 2003, Shmueli et al. 2005). The Poisson, the Geometric, and the Bernoulli distributions are special cases of the COM-Poisson (with $\nu = 1, 0$, and ∞, respectively). This distribution is defined over positive integers and is flexible in representing a variety of shapes. In particular, it is flexible in accounting for overdispersion as well as underdispersion in the data relative to the Poisson. Although neither the mean nor variance of this

[10] We model $Z_{ht} = (SERV_{ht} - 1)$ so that the domain of Z_{ht} is $[0, \infty)$.

distribution has convenient closed-form expressions, modern computing overcomes this inconvenience, allowing us to utilize the advantages this distribution offers over simpler discrete distributions.

The parameter λ_{1ht} (λ_{2ht}) given ν_1 (ν_2) is proportional to the expected number of promotions redeemed (services bought) on each purchase occasion by customer h (from the probability mass function of the COM-Poisson distribution; see Shmueli et al. 2005), making it a measure of central tendency.

The interpurchase time ($TIME_{ht}$) and the purchase amount ($AMNT_{ht}$) are modeled as log-normal processes (Equations (3) and (4)) with (λ_{3ht}, ν_3) and (λ_{4ht}, ν_4) as the corresponding parameters (mean and variance, respectively) of the distributions.

The effects of survey participation and various customer and store-specific variables are introduced by specifying λ_{1ht}, λ_{2ht}, λ_{3ht}, and λ_{4ht} as follows:[11]

$$\log \lambda_{1ht} = \lambda_{10h} + \left(\lambda_{11} T_{ht} + \sum_{m=1}^{M} \delta_{1m} HH_{m,h} + \sum_{n=1}^{N} \gamma_{1n} ST_{n,ht} \right)$$
$$+ \left(\lambda'_{10} + \lambda'_{11} T_{ht} + \sum_{m=1}^{M} \delta'_{1m} HH_{m,h} \right.$$
$$\left. + \sum_{n=1}^{N} \gamma'_{1n} ST_{n,ht} \right) I_{ht} + \eta_1 I_h. \qquad (6)$$

$$\log \lambda_{2ht} = \lambda_{20h} + \left(\lambda_{21} T_{ht} + \sum_{m=1}^{M} \delta_{2m} HH_{m,h} + \sum_{n=1}^{N} \gamma_{2n} ST_{n,ht} \right)$$
$$+ \left(\lambda'_{20} + \lambda'_{21} T_{ht} + \sum_{m=1}^{M} \delta'_{2m} HH_{m,h} \right.$$
$$\left. + \sum_{n=1}^{N} \gamma'_{2n} ST_{n,ht} \right) I_{ht} + \eta_2 I_h. \qquad (7)$$

$$\lambda_{3ht} = \lambda_{30h} + \left(\lambda_{31} T_{ht} + \sum_{m=1}^{M} \delta_{3m} HH_{m,h} + \sum_{n=1}^{N} \gamma_{3n} ST_{n,ht} \right)$$
$$+ \left(\lambda'_{30} + \lambda'_{31} T_{ht} + \sum_{m=1}^{M} \delta'_{3m} HH_{m,h} \right.$$
$$\left. + \sum_{n=1}^{N} \gamma'_{3n} ST_{n,ht} \right) I_{ht} + \eta_3 I_h. \qquad (8)$$

$$\lambda_{4ht} = \lambda_{40h} + \left(\lambda_{41} T_{ht} + \sum_{m=1}^{M} \delta_{4m} HH_{m,h} + \sum_{n=1}^{N} \gamma_{4n} ST_{n,ht} \right)$$
$$+ \left(\lambda'_{40} + \lambda'_{41} T_{ht} + \sum_{m=1}^{M} \delta'_{4m} HH_{m,h} \right.$$
$$\left. + \sum_{n=1}^{N} \gamma'_{4n} ST_{n,ht} \right) I_{ht} + \eta_4 I_h. \qquad (9)$$

[11] This approach is similar to that followed in Borle et al. (2005) wherein they studied the impact of product assortment changes across a set of experimental and control groups.

In the above equations, I_{ht} is an indicator variable that takes on a value $= 1$ if customer h participated in the satisfaction survey and the purchase occasion t was postsurvey participation. In all other cases, I_{ht} takes on value $= 0$. The variable T_{ht} indexes the purchase occasions (for customer h, purchase occasion t) after the administration of the survey.[12] The variables $HH_{m,h}$, $m = 1, \ldots, M$ are the M customer characteristics and $ST_{n,ht}$, $n = 1, \ldots, N$ are the N store-specific variables. In our application, we use six customer characteristics and four store-specific variables that are expected to moderate the effects of survey participation on customers. These variables are listed and defined in Table 2.

The customer characteristics and store-specific variables were chosen because they represent potentially important—and from a managerial standpoint, actionable—variables that could moderate the potential impact of survey participation on customers.

Thus, Equations (6) through (9) specify the impact of customer characteristics and store-specific variables and the time trend (denoted by T_{ht}) on the four dependent variables in two ways: First, parameters δ_{1m}, δ_{2m}, δ_{3m}, and δ_{4m} where $m = 1, \ldots, 6$ and parameters γ_{1n}, γ_{2n}, γ_{3n}, and γ_{4n} where $n = 1, \ldots, 4$ specify the impact of the six customer characteristics and the four store-specific variables, respectively, on the overall behavior (as specified by the four dependent measures) in the absence of survey participation, i.e., for the control group, and for the experimental group prior to survey participation. Similarly, the parameters λ_{11}, λ_{21}, λ_{31}, and λ_{41} specify the impact of the time trend (T_{ht}) on the four dependent variables in the absence of survey participation. Second, parameters λ_{11}', λ_{21}', λ_{31}', and λ_{41}' and δ_{1m}', δ_{2m}', δ_{3m}', and δ_{4m}' where $m = 1, \ldots, 6$ and parameters γ_{1n}', γ_{2n}', γ_{3n}', and γ_{4n}' where $n = 1, \ldots, 4$ specify the differential impact of these variables on the overall behavior in the presence of survey participation. Thus we can delineate the contributing impact of a time trend and the customer- and store-specific variables on the effect of participating in the survey. The sum of these sets of parameters would specify the overall impact of the corresponding variables on the four behaviors in the presence of survey participation.[13]

The remaining parameters in Equations (6) through (9) are the overall customer-specific intercepts (λ_{10h}, λ_{20h}, λ_{30h}, and λ_{40h}), the difference in the intercept terms due to survey participation (λ_{10}', λ_{20}', λ_{30}',

Table 2 Customer Characteristics and Store-Specific Variables Used in the Analysis

Variable	Description
Panel A. Customer characteristics	
$GENDER_h$	Dummy variable indicating customer h's gender
AGE_h	Estimated average age of customer h in years
$TENURE_h$	Number of times customer h bought from the prior to the survey
$YEAR_h$	Year of manufacture of the vehicle of customer h
$INCOME_h$	Natural log of the estimated median household income ($) for customer h
$HHSIZE_h$	Customer h's estimated household size
PANEL B. Store-specific variables	
$TPUT_{ht}$	A measure of the average throughput time for the store in which customer h shopped on purchase occasion t.*
$BAYS_{ht}$	Number of service bays in the store in which customer h shopped on purchase occasion t
$OWNERSHIP_{ht}$	Dummy variable indicating the ownership of the store (whether company owned, code $= 1$, or franchisee owned, code $= 0$)
$LOUNGE_{ht}$	Dummy variable indicating the presence of a customer lounge in the store in which customer h shopped on purchase occasion t

*It is the total throughput time weighted by the number of services bought. This variable is then normalized by dividing it by the average throughput time across all the stores.

and λ_{40}'), and the coefficients on a dummy variable I_h ($= 1$ if customer h participated in the satisfaction survey). The dummy variable I_h is introduced as an attempt to control for selection bias.[14] The values of the coefficients λ_{10}' through λ_{40}' would specify any residual survey effect not explained by either the time trend nor the household or store characteristics.

Next, to allow for covariation in the four dependent variables, we introduce a correlation structure across the four equations ((6) through (9)) as follows:

$$\boldsymbol{\lambda}_{0h} \sim MVNormal(\bar{\boldsymbol{\lambda}}_0, \boldsymbol{\Sigma}), \tag{10}$$

where $\boldsymbol{\lambda}_{0h} = [\lambda_{10h}, \lambda_{20h}, \lambda_{30h}, \lambda_{40h}]'$, $\bar{\boldsymbol{\lambda}}_0 = [\bar{\lambda}_{10}, \bar{\lambda}_{20}, \bar{\lambda}_{30}, \bar{\lambda}_{40}]'$ and $\boldsymbol{\Sigma}$ is the 4×4 variance-covariance matrix. The off-diagonal elements of the $\boldsymbol{\Sigma}$ matrix specify the structure of covariance across the four variables (i.e., number of promotions redeemed, number of services bought, interpurchase time, and purchase amount). Incorporating such a covariance structure allows for dependencies across the four behaviors and is a more efficient use of information in the data.

3.2. Model Estimation
The Bayesian specification of the model (Equations (1) through (10)) is completed by assigning appropriate

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[12] Thus, for the first purchase occasion of customer h in the period after survey participation $T_{ht} = 1$, for the second $T_{ht} = 2$, and so forth.

[13] For example, the sum $\delta_{11}^* = \delta_{11} + \delta_{11}'$ would specify the impact of the first customer characteristic ($GENDER_h$) on the number of promotions redeemed in the presence of survey participation.

[14] Although the firm purports to have randomly selected the survey participants, there is always a possibility of inadvertent selection bias and one needs to attempt to control or account for this bias to the extent possible.

prior distributions on the parameters to be estimated. Appendix 1 lays out the prior distributions used in the analysis. The model is estimated using an MCMC sampling algorithm, details of which can be obtained from the authors on request. The result is a set of posterior distributions on each parameter to be estimated. These posterior distributions are summarized in the next section.

4. The Estimated Results

The posterior distributions obtained from the sampling scheme are summarized by their means and standard errors. The following section, along with Appendix 2,[15] interprets and describes the estimated coefficients. The figures in parentheses (in various tables) are the posterior standard deviations. The convergence diagnostics were carried out using the Bayesian Output Analysis (BOA) program Version 0.5.0.

Before we present and discuss the impact of customer characteristics and store-specific variables on the effects of survey participation, we must point out that, as a validation check (for the existence of the survey participation effect), we also estimated a simpler version of Equations (6) through (9) with just the customer-specific intercepts, a single coefficient on I_{ht} and I_h. In this simpler version, the estimated coefficient on I_{ht} would be a measure of the average effect of survey participation. The signs of these coefficients ratify previous findings such as those of D&M and CMR regarding how survey participation potentially influences customer behaviors. In particular, at the aggregate level, participation in the customer satisfaction survey is associated with an increase in number of promotions redeemed (about 7.4% increase), an increase in number of services bought (a 3.5% increase), a decrease in interpurchase time (a decrease of 4.9%), and an increase in the dollar amounts spent on each occasion (increase of about 5.6%).[16]

Table 3 contains estimates for the parameters other than the customer characteristics, store, and time trend variables.

The parameters ν_1 and ν_2 are the "decay" parameters of the COM-Poisson distributions (the distribution of number of promotions redeemed and number of services bought, respectively, Equations (1) and (2)). A value of 1 for this parameter indicates a Poisson distribution, while values less than 1 indicate overdispersion and values greater than 1 indicate underdispersion relative to the Poisson. Interestingly, both ν_1

[15] For simplicity in presentation in the main text, many of the estimated coefficients and their detailed description have been provided in Appendix 2.

[16] The details of this simpler analysis can be obtained from the authors on request.

Table 3   Parameter Estimates*

$PROM_{ht}$	ν_1	**4.6939** (0.05308)	$\bar{\lambda}_{10}$	**−0.3199** (0.16072)	λ'_{10}	0.1420 (0.18648)	η_1	**0.2051** (0.05631)
$SERV_{ht}$	ν_2	**0.6118** (0.01690)	$\bar{\lambda}_{20}$	**−0.5903** (0.07599)	λ'_{20}	−0.0119 (0.10773)	η_2	0.0286 (0.02520)
log $TIME_{ht}$	ν_3	**0.2544** (0.00200)	$\bar{\lambda}_{30}$	**4.4937** (0.04281)	λ'_{30}	0.0422 (0.05501)	η_3	**0.1004** (0.01285)
log $AMNT_{ht}$	ν_4	**0.1845** (0.00148)	$\bar{\lambda}_{40}$	**3.6674** (0.03845)	λ'_{40}	−0.0251 (0.04413)	η_4	0.0153 (0.01109)

The correlation matrix

	$PROM_{ht}$ (%)	$SERV_{ht}$ (%)	log $TIME_{ht}$ (%)	log $AMNT_{ht}$ (%)
$PROM_{ht}$	**100** (0.00)	**−3.53** (2.16)	0.16 (1.98)	**−21.88** (1.86)
$SERV_{ht}$	**−3.53** (2.16)	**100** (0.00)	**12.91** (2.15)	**80.39** (0.88)
log $TIME_{ht}$	0.16 (1.98)	**12.91** (2.15)	**100** (0.00)	**8.22** (1.96)
log $AMNT_{ht}$	**−21.88** (1.86)	**80.39** (0.88)	**8.22** (1.96)	**100** (0.00)

*The bold italicized estimates indicate that the 95% posterior interval does not contain 0.

and ν_2 are significantly different from 1, thus rejecting a Poisson model. Furthermore, ν_1 is greater than 1 and ν_2 is less than 1, indicating underdispersion in the distribution of number of promotions redeemed and an overdispersion in the distribution of number of services bought. This demonstrates the added flexibility of the COM-Poisson whereby it can account for both under- and overdispersion observed in the data. It is pertinent to point out here that there are other options to dealing with overdispersion in the data; for example, the NBD distribution is a good candidate for modeling overdispersed data. However, the COM-Poisson has the added flexibility to account for underdispersion as well.

The vector $[\bar{\lambda}_{10}, \bar{\lambda}_{20}, \bar{\lambda}_{30}, \bar{\lambda}_{40}]'$ is the mean of the heterogeneity distribution over the customer-specific intercepts in Equations (6) through (9), and the correlation matrix specifies the correlation structure across these intercepts. All the estimated terms of the correlation matrix have intuitive signs, and this lends some robustness and credibility to the estimated model. An interesting phenomenon observed in this matrix is that customers who redeem more promotions tend to be *cherry pickers*: They buy fewer services (a negative correlation with number of services bought) and spend less money during their visits. The other interesting correlation observed is between the interpurchase time and the purchase amount (8.22%). This implies that customers who spend more take more time to spend; However, the relationship is weak.

The set of parameters η_1, η_2, η_3, and η_4 attempt to control for any selection bias differences between the experimental and the control customer groups; their estimated values indicate that there was no selection

Table 4   **Potential Impact of Customer Characteristics**

	No. of promotions redeemed		No. of services bought		Interpurchase time		Purchase amount	
	Baseline impact	Survey impact	Baseline impact	Survey impact	Baseline impact	Survey impact	Baseline impact	Survey impact
$GENDER_h$	Women redeem more promotions	No change	Women buy more services	No change	Men visit the store more often	No change	No impact	No change
AGE_h	Older customers redeem more promotions	No change	No impact	Younger customers buy more services	Older customers visit store less often	No change	Older customers spend less money	No change
$TENURE_h$	No impact	No change	No impact	No change	Larger tenure customers visit store less often	No change	Larger tenure customers spend more money	This tendency gets nullified
$YEAR_h$	Newer vehicles redeem fewer promotions	No change	Newer vehicles buy fewer services	This tendency of newer vehicles gets nullified	Newer vehicles visit store more often	Minor decrease in store visits by new vehicles	No impact	Newer vehicles spend more money
$INCOME_h$	Richer customers redeem more promotions	No difference in redemption across incomes	Richer customers buy more services	No change	Richer customers visit store less often	This tendency of richer customers gets diminished	Richer customers spend more money	No change
$HHSIZE_h$	No impact	No change	No impact	No change	No impact	No change	Larger households spend less money	This tendency of larger households gets nullified

bias with respect to the number of services bought and the total amount spent across the two groups. However, the customer groups do differ in terms of number of promotions redeemed and the interpurchase times, and the parameters η_1 and η_3 control for this residual difference.

The finding regarding the positive effect of survey participation on coupon redemption is particularly noteworthy. These results demonstrate—for the first time, to our knowledge—that survey participation is not only associated with increased service purchase and use, as previous studies have found, but also potentially positively affects respondents' subsequent responsiveness to the firm's promotions.

4.1. Potential Impact of Customer Characteristics on Effects of Survey Participation[17]

The table of estimated coefficients and their detailed description is provided in Appendix 2. Table 4 contains a verbal description of the impact of customer characteristics on the four customer behaviors (number of promotions redeemed, number of services bought, interpurchase time, and purchase amounts). In the table, shaded boxes are areas where the survey had a significant impact on behavior.

[17] Throughout the paper, for reasons to be discussed later (§5), we attribute significant correlations to a causal relationship. We thank the editor and the associate editor for suggesting this clarification.

Considering the customer's age, the results may be interpreted as suggesting a diminishing effect of survey participation with increasing age. Upon survey participation, younger customers tend to buy more services when compared to older customers (about 2% more services for every 10 years' age difference). With respect to tenure of the customer (as defined in Table 2), we find that the effect of customer tenure diminishes after survey participation. Previous research on the role of customer experience has found that greater customer experience with the firm at the time of survey participation tends to attenuate the survey participation effect (Morwitz et al. 1993). In our study, we used customer tenure with the firm as a measure of the customer's experience level and our results seem to agree with these previous findings in the sense that we find no differential impact of survey participation on three of the four customer behaviors (number of promotions redeemed, number of services bought, and interpurchase times). However, we do find a negative effect of tenure on the amounts spent on each purchase occasion.

The finding that the customer's age diminishes the impact of participating in the satisfaction survey can be explained by the fact that older customers are likely to be more experienced not only with purchasing automotive services, but also with respect to the firm, even before the survey. Such customers should

therefore be less likely to gain additional useful information from the survey, or to form measurement-induced judgments that are posited to underlie the survey participation effect (Fitzsimons and Williams 2000, Morwitz and Fitzsimons 2004, Dholakia et al. 2005). In contrast, younger customers will be the ones that are likely to have uncrystallized opinions regarding the firm. The survey should therefore be more impactful for them, leading to greater effects afterward.

Considering the age of the customer's vehicle, the results show that the newer the customer's vehicle, the greater the impact of survey participation on his or her subsequent behaviors. The tendency of customers with newer vehicles to buy fewer services is nullified on responding to the survey (Table 4). Furthermore, following survey participation, customers with newer vehicles tend to spend more money on each purchase occasion (on average, one year of "newness" roughly corresponds to an increase of about 0.4% spent on each occasion).

Along the lines of previous research (Fitzsimons and Williams 2000, Morwitz and Fitzsimons 2004, Dholakia et al. 2005), it can be argued that customers with newer vehicles are likely to care more about which service provider they use for their vehicle's maintenance and are therefore more likely to consider the survey to provide information regarding the firm's customer orientation. Such customers might also be relatively less experienced with the firm, having purchased the car relatively recently. As a result, they should be more affected by the survey, consistent with our finding.

We find that there is a minor increase in the interpurchase times for customers with newer vehicles in the presence of survey participation, but this effect is very small, and the net effect still is that newer vehicles tend to visit the store more often.

We find that customers with newer vehicles redeem fewer promotions, and this remains unchanged even after survey participation. One possibility for this could be that, conditional on the income and other factors, customers with newer vehicles might be relatively less price sensitive with respect to the services they purchase for their vehicle. Thus, they would be less likely to care about and hence redeem more promotions.

Considering the impact of customer's household income and household size, the results suggest that the difference in promotion sensitivities between higher-income and lower-income customers vanishes on survey participation and that the tendency of higher-income customers to visit the store less often gets significantly reduced (by almost 50%).[18] Further-

more, we find that the tendency of larger households to spend less per visit diminishes postsurvey participation, indicating yet another positive effect of survey participation.

These results regarding the positive effects of household income and household size on the impacts of survey participation are more difficult to explain directly using the explanations of either measurement-induced judgments or informativeness of the survey itself. It could be that these demographic variables are positively associated with psychological variables such as thoughtfulness of information processing or persuasion knowledge of individual customers (e.g., Friestad and Wright 1994), which in turn lead to greater impact of survey participation. More research at the psychological level is needed to better understand why the influence of survey participation increases with household income and household size.

4.2. Potential Impact of Store-Specific Variables on Effects of Survey Participation

Table 5 contains a verbal description of the impact of store-specific variables on the four customer behaviors. (For details, please see Appendix 2.) As in Table 4, shaded boxes are areas where the survey had a significant impact on behavior.

A very interesting result in the analysis concerns the impact of store ownership (whether the store is company owned or franchisee owned[19]) on the survey participation effect. In the absence of survey participation, the company-owned stores seem to be underperformers relative to the franchisee-owned stores. In particular, customers tend to redeem fewer promotions as well as buy fewer services at such stores. On average, 8.2% fewer promotions are redeemed and 2.2% fewer services are bought in company-owned stores. However, these stores tend to benefit the most from the effects of survey participation on customers. The tendency of customers to redeem fewer promotions at company-owned stores is reversed in the presence of participation in the customer satisfaction survey; the company-owned stores now tend to get 7.5% more redemptions from these customers as compared to the franchisee-owned stores. The tendency of customers to buy fewer services at company-owned stores also is nullified following survey participation: Now there is no difference in the number of services bought in company-owned versus franchisee-owned stores. Additionally, the positive effects of survey participation to a company-owned store are manifested in the higher amounts being spent by respondents at

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[18] For example, a 50% increase in income leads to an overall increase of 3.4% in the interpurchase times. However, in the presence of

the survey participation effect, this increase gets lowered to a net 1.7% increase in interpurchase times.

[19] $OWNERSHIP_{ht} = 1$ implies company owned and $= 0$ implies franchise store.

Table 5   **Potential Impact of Store-Specific Variables**

	No. of promotions redeemed		No. of services bought		Interpurchase time		Purchase amount	
	Baseline impact	Survey impact	Baseline impact	Survey impact	Baseline impact	Survey impact	Baseline impact	Survey impact
$TPUT_{ht}$	Fewer redemptions at high throughput time stores	No change	No impact	No change	Fewer visits made to high throughput time stores	No change	More money spent on high throughput time stores	No change
$BAYS_{ht}$	More promotions redeemed at stores with more bays	No change	No impact	No change	No impact	No change	No impact	No change
$OWNERSHIP_{ht}$	Fewer promotions redeemed at company owned stores	Greater promotions redeemed at company owned stores	Fewer services bought at company-owned stores	No difference in services bought across stores	No impact	No change	No impact	More amount spent on company-owned stores
$LOUNGE_{ht}$	More promotions redeemed at stores with a lounge	No difference in redemptions across stores	No impact	No change	No impact	No change	No impact	No change

the store following survey participation (about 2.7% greater spends on the part of the survey respondents in company-owned stores as opposed to franchisee-owned stores).

This finding, that survey participation has more beneficial effects on customers purchasing at company-owned stores of the firm than at franchisee-owned stores, which is robust across three of the four customer behaviors studied—promotion sensitivity, number of services purchased, and amount spent—represents, to our knowledge, the first instance of a firm characteristic determining the strength of the survey participation effect on customers. Two possibilities could explain this difference. The first possibility arises from the fact that, on average, this firm's company-owned stores offer a larger menu of services to their customers than its franchisee-owned stores. As a result, it could be that following survey participation, customers visiting company-owned stores simply have more opportunities to act in accordance with their positive evaluations relative to those visiting franchisee-owned stores. Second, this firm also has a well-developed CRM system, and at the point of sale, service technicians (in both the company-owned and franchisee-owned stores) have access to customer details. It could be that, postsurvey, company-owned store employees are more responsive to their customers when compared to employees of franchisee-owned stores, leading to more positive behaviors from customers who visit the former stores. Further research is needed to examine which (or both) of these explanations, or other explanations, are responsible

for these differences. At any rate, this finding is significant for managers and is likely to raise the profile of customer satisfaction surveys among them.

4.3. Potential Impact of Time Trend on Effects of Survey Participation

Equations (6) through (9) also contain a time trend variable T_{ht}, which is the index number of the purchase occasion (for customer h, purchase occasion t) in the period after participation in the survey. The corresponding coefficients delineate the impact of a time trend[20] in the presence and absence of survey participation; Table 6 contains a verbal description of the impact (for details, please see Appendix 2).

In the absence of survey participation (i.e., in the time period following survey administration for the control group customers), we find that there is an increasing time trend for number of services bought (an increase of about 2.3% with each purchase occasion), a decreasing time trend for interpurchase times (a decrease of 1.2% in the interpurchase times with each purchase occasion). For the purchase amounts, too, there is an increasing time trend (an increase of 2.5% expenditure with each purchase occasion).[21]

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[20] Please note that we use a very general interpretation of the word trend. Our interpretation simply is that, given the time span of data postsurvey, how the survey effect across the four behaviors changed (linearly) across purchase occasions.

[21] The estimated time trend for the number of promotions redeemed is also positive, a 1.2% increase. However, the parameter λ_{11} is significant only at a 90% significance level.

Table 6   Potential Impact of a Time Trend

	No. of promotions redeemed		No. of services bought		Interpurchase time		Purchase amount	
	Baseline impact	Survey impact	Baseline impact	Survey impact	Baseline impact	Survey impact	Baseline impact	Survey impact
T_{ht}	An increase in number of promotions with time.	No change.	An increase in services bought with time.	This increasing time trend is diminished.	Increase in store visits with time.	This rate of increase in store visits is further increased.	Increase in money spent with time.	This increasing time trend is diminished.

In general, we would expect the survey participation effect to wear off with time (D&M). We have one year's observations postsurvey participation, so our time horizon to notice this wearing-off effect is one year. We find that in the presence of survey participation, one year is enough time for the impact to start wearing off on the number of services bought and the amount expended. The rate of increase in the number of services bought and the amount expended decreases from 2.3% and 2.5%, respectively, to less than 1%.

One year, however, does not seem to be enough time for the effects of survey participation on number of promotions redeemed and the interpurchase times to wear off. The rate of increase in the number of promotions redeemed with every purchase occasion remains at a similar level (to that in the absence of survey participation). However, the rate of decrease in interpurchase times further decreases from a decrease of 1.2% to a decrease of 3.3% in the presence of survey participation. We find that the impact of participating in the survey on the interpurchase times has a much-delayed effect relative to the impact on the other behaviors (number of promotions redeemed, number of services bought, and amount expended). This result is interesting and raises the possibility that survey participation could produce complex time-varying effects. We believe that this result provides opportunity for further research.[22]

5. General Discussion

5.1. Summary of Results
Consistent with prior research (e.g., D&M, CMR) and our own assessment of the evidence, we attribute the correlation between survey participation and customer behavior to the impact of survey participation

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[22] We also explored fitting a quadratic trend variable and found it (the quadratic part of the trend variable) to have insignificant impact on three of the four behaviors (number of services bought, interpurchase time, and purchase amounts). However, there was a nonlinear impact on the number of promotions redeemed. This is being further investigated in a related but different work by the authors.

on customer behavior. Given such an attribution, in our study conducted with a U.S. automotive services firm we found substantial effects of survey participation on all customer behaviors examined, including number of coupons redeemed, number of services purchased, purchase frequency, and amount of money spent on each visit to the firm's stores. Building on the previous studies that had examined customer behaviors in the aggregate, we found the effects of survey participation to be moderated by customer characteristics as well as store-specific variables, and also to vary over time.

In particular, using a joint modeling methodology, we found that newness of the customer's vehicle, household income, and household size all generally increased the impact of participating in surveys on customer behavior. On the other hand, the customer's age and his or her tenure with the firm were generally found to reduce the impact of survey participation.

Considering the role of store-specific variables, we found survey participation to have more beneficial effects on customers purchasing at company-owned stores of the firm than at franchisee-owned stores. This finding was robust across three of the four customer behaviors studied with regard to promotion sensitivity, number of services purchased, and amount spent. To our knowledge, this is the first documented instance of a firm characteristic determining the strength of the survey participation effect on customers.

Finally, analyses of the effects of survey participation over time reveal that the increase in both number of services purchased and amount spent postsurvey starts wearing off within a year after the survey, but the increase in number of promotions redeemed and reduction in interpurchase times persists even a year afterward. These findings affirm the persistence of the impact of conducting a short survey that previous studies such as those of D&M have found.

5.2. Managerial Implications
Although future research might verify our inferences about the direction of causality, our research has potentially significant substantive implications for commercial marketing research practice. Although

recent concerns have been raised over the growing resistance of consumers to participation in commercial survey research studies (e.g., Bearden et al. 1998, Shea and LeBourveau 2000), we find that, for the firm-sponsored satisfaction survey in the present case, customers do not appear to be so negatively disposed, at least as reflected by their subsequent behaviors. In fact, we found that survey participants engaged in more of each form of behavior we studied, relative to their behavior prior to the satisfaction survey, and that of a control group of survey nonparticipants. At the aggregate level, the finding regarding the positive impact of satisfaction survey participation on promotion responsiveness is especially noteworthy. This result establishes a link between participation in a customer satisfaction survey and subsequent responsiveness of the customer to the firm's promotions.

Our analysis, which revealed the moderating role of customer characteristics and store-specific variables, provides a useful approach to marketing researchers to minimize the unintended consequences of conducting survey-based satisfaction research. In particular, researchers can first identify which variables accentuate the impact of satisfaction survey participation, then quantify the degree of this impact as in the present case, and finally use this information to develop appropriate sampling schemes in subsequent survey-based projects. Such a procedure is especially relevant for commercial marketing research applications where researchers usually have considerable leeway in choosing their sampling procedures, and have access to large customer databases from which to draw their samples (e.g., Almquist and Wyner 2001, Crosby and Johnson 2001).

Managers commissioning survey-based satisfaction studies are often interested in understanding the net financial impact of conducting the research (Dholakia et al. 2005). Studies such as those of D&M and CMR have implied that positive benefits can be significant. However, while findings such as these suggest that the conventional view of the marketing research function as a cost center needs to be rethought (at least for satisfaction surveys), the present research provides managers who are interested in valuing the financial impact of conducting satisfaction surveys guidance toward a more accurate way of doing so. In particular, by identifying the specific drivers that moderate the impact of satisfaction survey participation, a scoring procedure could easily be implemented to determine the expected impacts on each of the respondents, yielding a cumulative estimate that is more accurate.

5.3. Limitations

One concern that has been raised by prior research examining influences of survey participation (e.g., Morwitz et al. 1993) is that such effects might be explained, at least in part, by nonresponse bias because responders to the survey may be more involved and interested than are nonresponders, and therefore more prone to engage in product purchase and use subsequently. In the present survey, the response rate of customers (number of contacted people responding to the survey) was in the 90%–95% range. The number of customers actually chosen for the survey was not available; however, consultations with the market research vendor and experience with other such studies led us to believe that contact rates were between 60% and 70%, leading to a net response rate between 54% and 67%. Although this response rate is high compared to industry standards, our results should be interpreted cautiously. It could be that there is an oversampling of interested and involved customers simply because they chose to be contacted, and then they participated in the survey.

A second related concern is the issue of concluding causality, i.e., drawing the conclusion that survey participation causes changes in customer behaviors, in mere measurement research. (See Shugan 2006 for a detailed discussion regarding this issue.) In the present study as well as in prior research we have cited, such as the D&M and the CMR studies, causality cannot be definitively established because there is at least some degree of selection bias in the respondent sample. In particular, customers who were accessible and agreed to be surveyed were compared against a control group of nonparticipants. A stronger test to establish causality requires an experimental design in which the firm creates two random lists of customers. One list is then assigned to the marketing research vendor which then conducts the survey using the list. The second list of customers serves as the control list. The appropriate test of the mere measurement effect is to compare the behaviors of all the customers from the two lists with each other. Future research should execute such a test to unequivocally show existence of the mere measurement effect.[23]

Acknowledgments

Appendix 1. Prior Specification
The joint model to be estimated is specified by Equations (1) through (10). We use a hierarchical Bayes approach using an Markov chain Monte Carlo (MCMC) sampler (Casella and George 1992, Gelfand and Smith 1990) to estimate the model. The following subsection lays out the prior parameter specifications associated with the estimated model.

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[23] We thank the associate editor for pointing this issue out to us, and for suggesting this unequivocal test for the existence of the mere measurement effect.

Table A1.1   The Priors Used in the Estimation

Parameter	Priors
$\nu_1, \nu_2, \nu_3, \nu_4$	Inverse gamma (2.5, 0.5)
$\lambda_{11}, \lambda_{21}, \lambda_{31}, \lambda_{41}, \lambda'_{11}, \lambda'_{21}, \lambda'_{31}, \lambda'_{41}$	Normal (0, 100)
Various δ's and δ''s [Equations (6) through (9)]	Normal (0, 100)
Various γ's and γ''s [Equations (6) through (9)]	Normal (0, 100)
$\eta_1, \eta_2, \eta_3, \eta_4$	Normal (0, 100)
$\lambda'_{10}, \lambda'_{20}, \lambda'_{30}, \lambda'_{40}$	Normal (0, 100)
$\bar{\boldsymbol{\lambda}}_0 = [\bar{\lambda}_{10}, \bar{\lambda}_{20}, \bar{\lambda}_{30}, \bar{\lambda}_{40}]'$	MVNormal ([0, 0, 0, 0], 10**I**)
$\boldsymbol{\Sigma}$	Inv Wishart (1, 10**I**, 10)

A1.1.   Prior Specifications

Table A1.1 provides the priors used in the estimation. Parameters ν_1, ν_2, ν_3, and ν_4 specify the scale parameters of the two COM-Poisson distributions and two log-normal distributions, respectively (Equations (1) through (4)). Other than the information that scale parameters are defined over the positive real line, we do not have any a priori information on the likely magnitudes. A prior of inverse gamma (2.5, 0.5) is consistent with these prior beliefs.

Similarly, all the parameters that specify the impact of a time trend (λ_{11}, λ_{21}, λ_{31}, λ_{31} and λ'_{11}, λ'_{21}, λ'_{31}, λ'_{41} in Equations (6) through (9)), impact of customer characteristics (various δs and δ's, Equations (6) through (9)) and impact of store-specific variables (various γs and γ's, Equations (6) through (9)) on the four dependent variables are given a prior of Normal (0, 100). The reason is that we do not have any sharp prior beliefs on either the magnitude or the signs of these effects, and a Normal (0, 100) is a reasonable representation of these prior beliefs.

Parameters η_1, η_2, η_3, η_4 in Equations (6) through (9) are the coefficients on the dummy variable I_h, which in turn is introduced as an attempt to control for any residual selection bias. We expect the magnitudes for these coefficients to be relatively closer to zero since a random procedure was used by the firm to select respondents. However, we still use a relatively diffuse prior (a Normal [0, 100]) for these parameters.

The parameter $\bar{\boldsymbol{\lambda}}_0 = [\bar{\lambda}_{10}, \bar{\lambda}_{20}, \bar{\lambda}_{30}, \bar{\lambda}_{40}]'$ is the mean of the heterogeneity distribution over $\boldsymbol{\lambda}_{0h} = [\lambda_{10h}, \lambda_{20h}, \lambda_{30h}, \lambda_{40h}]'$ (Equation (10)). We center our prior distribution about zero on $\bar{\boldsymbol{\lambda}}_0$, the four-dimensional expectation of $\boldsymbol{\lambda}_{0h}$. The prior specified has a large variance to accommodate a wide range of $\bar{\boldsymbol{\lambda}}_0$. The parameter $\boldsymbol{\Sigma}$, is the covariance matrix for $\boldsymbol{\lambda}_{0h}$, and the inverse wishart prior on $\boldsymbol{\Sigma}$ introduces a mild shrinkage and is consistent with our little prior knowledge on this parameter.

Appendix 2.   The Set of Estimated Coefficients

A2.1.   Potential Impact of Customer Characteristics on Effects of Survey Participation

Table A2.1 contains estimates of parameters (of our full model) reflecting the impact of customer characteristics on the four customer behaviors (number of promotions redeemed, number of services bought, interpurchase time, and purchase amounts). The two sets of parameters (one set

with no superscripts in panel A and the other set with a "*" superscript in panel B) delineate this impact in terms of an impact in the absence of and in the presence of survey participation, respectively.[24]

The customer's gender is a significant variable in the overall context; however, gender does not have a differential impact in presence of survey participation (the differences $\delta^*_{11} - \delta_{11}$, $\delta^*_{21} - \delta_{21}$, $\delta^*_{31} - \delta_{31}$, and $\delta^*_{41} - \delta_{41}$ are all statistically insignificant). With respect to overall behavior, women (binary code = 0) redeem more promotions (about 9.7% more promotions) as well as buy more services on each purchase occasion (5.1% more services) (parameters δ_{11} and δ_{21}, respectively) when compared to men. However, men visit the store more often than women (men's frequency of visits is about 12% more than women) (parameter δ_{31}).[25] Furthermore, gender does not seem to be associated with differences in the impact of survey participation on subsequent customer behaviors, because both genders have similar coefficients in both presence and absence of survey participation.

As with gender, the age of the customer has a significant overall impact on behavior. On the whole, older customers tend to redeem more promotions, visit the store less frequently, and tend to spend less on each visit (parameters δ_{13}, δ_{33}, and δ_{43}, respectively). Upon survey participation, there is no change in the increased promotion sensitivity and decreased expenditure on the part of older customers (δ^*_{13} and δ^*_{43}, respectively). However, younger customers tend to buy more services than older customers (δ^*_{23}, about 2% more services for every 10 years of age difference), an effect not seen in the absence of survey participation. Furthermore, the differing impact of age on the frequency of visits disappears after survey participation (δ^*_{33} vs. δ_{33}).

Regarding the role of customer experience (operationalized as the *TENURE* variable in our study) the results largely agree with previous findings in the sense that we find no differences pre- and postsurvey participation on three of the four customer behaviors (number of promotions redeemed, number of services bought, and interpurchase times). However, we do find a negative impact of tenure postsurvey participation with respect to the purchase amount spent on each service visit. In our data, we observe that long-standing customers spend more (δ_{46}) in the absence of survey participation, although the magnitude of this effect is small (every extra encounter with the firm results in 0.2% more expenditure by the customer). However, postsurvey participation, this tendency of long-standing customers to spend more is attenuated, and disappears (the net result is a null effect, δ^*_{46}).

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[24] With reference to Equation (6) through (9), for example, $\delta^*_{12} = \delta_{12} + \delta'_{12}$, and so forth.

[25] It is pertinent to mention that the men/women comparison already accounts for the correlation across various behaviors (as specified by the variance covariance matrix). Thus it is a finer comparison than one without accounting for the correlation, which might be suspect in that it would pick up the natural covariance between these behaviors.

Table A2.1   Potential Impact of Customer Characteristics

		$GENDER_h$		AGE_h		$TENURE_h$		$YEAR_h$		$INCOME_h$		$HHSIZE_h$
					Panel A: In the *absence* of survey participation*							
$PROM_{ht}$	δ_{11}	**−0.1635** (0.04938)	δ_{13}	**0.0106** (0.00502)	δ_{16}	−0.0007 (0.00326)	δ_{12}	**−0.0375** (0.00701)	δ_{14}	**0.1196** (0.05541)	δ_{15}	0.0138 (0.05728)
$SERV_{ht}$	δ_{21}	**−0.1097** (0.02244)	δ_{23}	−0.0019 (0.00234)	δ_{26}	0.0007 (0.00183)	δ_{22}	**−0.0062** (0.00320)	δ_{24}	**0.0500** (0.02639)	δ_{25}	−0.0354 (0.02536)
$\log TIME_{ht}$	δ_{31}	**−0.1308** (0.01111)	δ_{33}	**0.0034** (0.00123)	δ_{36}	**0.0038** (0.00082)	δ_{32}	**−0.0230** (0.00159)	δ_{34}	**0.0814** (0.01290)	δ_{35}	−0.0183 (0.01366)
$\log AMNT_{ht}$	δ_{41}	0.0125 (0.00959)	δ_{43}	**−0.0029** (0.00103)	δ_{46}	**0.0022** (0.00068)	δ_{42}	0.0009 (0.00135)	δ_{44}	**0.0398** (0.01133)	δ_{45}	**−0.0354** (0.01177)
					Panel B: In the *presence* of survey participation							
$PROM_{ht}$	δ_{11}^{*}	**−0.1873** (0.05587)	δ_{13}^{*}	**0.0099** (0.00586)	δ_{16}^{*}	−0.0031 (0.00452)	δ_{12}^{*}	**−0.0419** (0.00800)	δ_{14}^{*}	−0.0002 (0.06666)	δ_{15}^{*}	0.0096 (0.06139)
$SERV_{ht}$	δ_{21}^{*}	**−0.1054** (0.02678)	δ_{23}^{*}	**−0.0047** (0.00278)	δ_{26}^{*}	−0.00002 (0.00222)	δ_{22}^{*}	0.0043 (0.00389)	δ_{24}^{*}	**0.0814** (0.03122)	δ_{25}^{*}	−0.0213 (0.02924)
$\log TIME_{ht}$	δ_{31}^{*}	**−0.1156** (0.01320)	δ_{33}^{*}	0.0020 (0.00144)	δ_{36}^{*}	**0.0026** (0.00109)	δ_{32}^{*}	**−0.0146** (0.00193)	δ_{34}^{*}	**0.0411** (0.01577)	δ_{35}^{*}	−0.0218 (0.01712)
$\log AMNT_{ht}$	δ_{41}^{*}	0.0040 (0.01143)	δ_{43}^{*}	**−0.0026** (0.00123)	δ_{46}^{*}	0.0005 (0.00089)	δ_{42}^{*}	**0.0037** (0.00162)	δ_{44}^{*}	**0.0596** (0.01300)	δ_{45}^{*}	−0.0109 (0.01342)

*The bold italicized estimates indicate that the 95% posterior interval does not contain 0.

Considering the age of the customer's vehicle, the results show that customers with newer vehicles redeem fewer promotions (are less promotion sensitive) and buy fewer services (parameters δ_{12} and δ_{22}, respectively). However, they tend to visit the store more often (δ_{32}). The impact of vehicle vintage in the presence of survey participation is interesting: The tendency of customers with newer vehicles to buy fewer services gets nullified postsurvey participation (parameter δ_{22}^{*}). Furthermore, postsurvey participation, customers with newer vehicles spend more money on each purchase occasion (on average, one year of "newness" leads to an increase of about 0.4% spent on each occasion). Conversely there is also a minor increase in the interpurchase times for customers with newer vehicles in the presence of survey participation (the difference is $\delta_{32}^{*} - \delta_{32}$). However, the net effect still is that newer vehicles tend to visit the store more often (there is no sign reversal of the parameter).

Overall, customers with higher income buy more services and spend more on each purchase occasion (parameters δ_{24} and δ_{44}, respectively). They also tend to visit the store less often (δ_{34}). However, these higher-income customers tend to be more promotion sensitive (δ_{14} is positive and significant). Postparticipation in the survey, this tendency of higher-income customers to be promotion sensitive is attenuated (δ_{14}^{*}), i.e., survey participation potentially tends to make higher-income customers less sensitive (as compared to the lower-income customers) to promotions. From the firm's perspective, the good news is that the tendency of higher-income customers to visit the store less often gets significantly diminished postparticipation in a satisfaction survey (δ_{34}^{*} vs. δ_{34}).

Finally, we find that an increase in the customer's household size is associated with a diminishing amount expended by the customer per visit (δ_{45}). In the absence of survey participation, customers with larger households spend less per visit. However, this effect gets attenuated postparticipation

in the survey (δ_{45}^{*} is not significantly different from 0), indicating yet another positive effect of survey participation.

A2.2. Potential Impact of Store-Specific Variables on Effects of Survey Participation

Table A2.2 contains estimates of parameters reflecting the impact of the store-specific variables on the four customer behaviors.

Parameters in panel A of Table A2.2 specify the impact of the store-specific variables on the four behaviors in the absence of survey participation, and those in panel B specify the impact of the store-specific on participation in the satisfaction survey.

Table A2.2   Potential Impact of Store-Specific Variables

		$TPUT_{ht}$		$BAYS_{ht}$		$OWNERSHIP_{ht}$		$LOUNGE_{ht}$
			Panel A: In the *absence* of survey participation					
$PROM_{ht}$	γ_{11} **−0.2460** (0.06715)	γ_{12} **0.0657** (0.01595)	γ_{14} **−0.1512** (0.06033)	γ_{13} **0.2172** (0.11211)
$SERV_{ht}$	γ_{21} −0.0350 (0.03289)	γ_{22} 0.0045 (0.00812)	γ_{24} **−0.0486** (0.02980)	γ_{23} −0.0722 (0.05459)
$\log TIME_{ht}$	γ_{31} **0.0340** (0.01578)	γ_{32} 0.0022 (0.00413)	γ_{34} −0.0183 (0.01437)	γ_{33} **0.1087** (0.02610)
$\log AMNT_{ht}$	γ_{41} **0.0523** (0.01350)	γ_{42} 0.0035 (0.00342)	γ_{44} 0.0060 (0.01258)	γ_{43} −0.0011 (0.02193)
			Panel B: In the *presence* of survey participation					
$PROM_{ht}$	γ_{11}^{*} **−0.2646** (0.07989)	γ_{12}^{*} **0.0502** (0.02047)	γ_{14}^{*} **0.1347** (0.07146)	γ_{13}^{*} −0.0309 (0.13137)
$SERV_{ht}$	γ_{21}^{*} 0.0035 (0.03971)	γ_{22}^{*} −0.0049 (0.01006)	γ_{24}^{*} −0.0054 (0.03366)	γ_{23}^{*} −0.0888 (0.06479)
$\log TIME_{ht}$	γ_{31}^{*} **0.0374** (0.01970)	γ_{32}^{*} −0.0051 (0.00512)	γ_{34}^{*} 0.0045 (0.01755)	γ_{33}^{*} **0.0724** (0.03246)
$\log AMNT_{ht}$	γ_{41}^{*} **0.0439** (0.01670)	γ_{42}^{*} 0.0041 (0.00435)	γ_{44}^{*} **0.0271** (0.01427)	γ_{43}^{*} −0.0258 (0.02584)

The $TPUT_{ht}$ variable is a measure of the total throughput time per service at the store. A greater value for this variable indicates a greater time taken for services at a particular store (in comparison to other stores of the firm). In general, we find that fewer promotions are redeemed and visits are made less frequently at stores with higher throughput times (γ_{11} and γ_{31}, respectively). On the other hand, higher amounts are spent per service visit at these stores (γ_{41}). It is important to note that a higher average throughput time could be either an indicator of inefficiency by a particular store, or a reflection of the fact that the store provides more time-consuming services.[26] Because is likely that time-consuming services cost more, our results point to this latter explanation: that there are particular stores that customers typically visit for their bigger maintenance needs.[27] It would be very interesting and informative for the firm to uncover such a cluster of stores. In postsurvey participation, there is no differential impact of the store throughput time on the four customer behaviors when compared to those cases where customers did not participate in the survey (parameters γ_{11} through γ_{41} are not significantly different from parameters γ_{11}^* through γ_{41}^*).

There is a positive relationship between the number of service bays at the store and the number of promotions redeemed (an additional bay corresponds to approximately 3.6% more promotions being redeemed at the store). However, this effect is not significantly influenced by survey participation. Other than this one overall impact, the number of bays in the store does not have a significant impact on the other three customer behaviors. Bigger stores are likely to have more bays and also generate more revenues; however, the revenue that we are measuring in this study is the revenue per customer per visit, and we find that this variable is not affected by the number of bays that a store has. It is possible that such bigger stores offer more services and subsequently have more promotion redemptions.

The presence of a customer lounge in the store has a positive relation to the number of promotions being redeemed by customers at the store (γ_{13}) (possibly, larger stores offering more services are more likely to have a lounge, therefore customers are more likely to redeem more promotions at such stores). However, this effect gets nullified in postsurvey participation (γ_{13}^*). In particular, following survey participation, the presence or absence of a lounge in the store has no impact on the number of promotions redeemed by the customers.

Considering the impact of store ownership (whether the store is company owned or franchisee owned),[28] we find that customers redeem fewer promotions as well as buy fewer services at the company-owned stores (γ_{14} and γ_{24}, respectively). On average, 8.2% fewer promotions are redeemed and 2.2% fewer services are bought in company-owned stores. However, postparticipation in the customer

Table A2.3 **Potential Impact of a Time Trend in the *Absence* and *Presence* of Survey Participation**

		Absence T_{ht}		Presence T_{ht}
$PROM_{ht}$	λ_{11}	0.0219 (0.01650)	λ_{11}^*	*0.0210* (0.01075)
$SERV_{ht}$	λ_{21}	*0.0475* (0.00739)	λ_{21}^*	*0.0164* (0.00584)
log $TIME_{ht}$	λ_{31}	-0.0125 (0.00387)	λ_{31}^*	-0.0332 (0.00269)
log $AMNT_{ht}$	λ_{41}	*0.0243* (0.00325)	λ_{41}^*	*0.0088* (0.00225)

satisfaction survey, the company-owned stores get 7.5% more redemptions compared to the franchisee-owned stores (γ_{14}^*). Furthermore, in postsurvey participation there is no difference in the number of services bought in company- versus franchisee-owned stores (γ_{24}^*). Additionally, higher amounts are spent by respondents at the store following survey participation (γ_{44}^*).

A2.3. Potential Impact of Time Trend on Effects of Survey Participation

Table A2.3 contains the set of coefficients on the variable T_{ht} (Equations (6) through (9)).

In the absence of survey participation (i.e., in the time period following survey administration for the control group customers) there is an increasing time trend for number of services bought (an increase of about 2.3% with each purchase occasion, parameter λ_{21}), and a decreasing time trend for interpurchase times (a decrease of 1.2% in the interpurchase times with each purchase occasion, calculated from λ_{31}). For the purchase amounts, too, there is an increasing time trend, showing an increase of 2.5% expenditure with each subsequent purchase occasion (parameter λ_{41}).[29]

We have one year's observation postsurvey participation, so our time horizon to notice any time effects is one year. The differences ($\lambda_{21} - \lambda_{21}^*$) and ($\lambda_{41} - \lambda_{41}^*$) are both positive and significant, indicating that one year is enough time for the impact to start wearing off on the number of services bought and the amount expended. However, the difference ($\lambda_{11} - \lambda_{11}^*$) is statistically insignificant, while the difference ($\lambda_{31} - \lambda_{31}^*$) is actually positive, indicating that one year does not seem to be enough time for the effects of survey participation on number of promotions redeemed and the interpurchase times to wear off.

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[26] The data contain no further information to segregate these effects.

[27] If the predominant reason for the increases in throughput was inefficiency, then it seems unlikely that customers would tend to spend more per visit in these inefficient stores.

[28] $OWNERSHIP_{ht} = 1$ implies company owned and $= 0$ implies franchisee owned.

[29] The estimated time trend for the number of promotions redeemed is also positive, a 1.2% increase. However, the parameter λ_{11} is significant only at a 90% significance level.

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