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The impact of customer-specific marketing expenses on customer retention and customer profitability

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**The impact of customer-specific marketing expenses on customer retention
and customer profitability**

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Abstract

We study the effects of customer-specific marketing expenses on customer retention and customer profitability in a business-to-business setting. Using data from a company providing hygiene services, we look at the impact of a type of expenses targeted at individual customer relationships: the offering of free equipment to customers (such as soap dispensers). The data allows tracking the activities performed in more than 4,500 customer relationships over a period of four years. Retention rates are higher for customers targeted with free equipment, but this effect results from an interaction with customer size. First-order dynamic panel data analyses show that the impact of targeted marketing expenses on customer dollar profit is positive for large customers, but there is no effect for smaller customers. Thus, targeted marketing expenses seem a tool for relationship maintenance rather than customer development: they help in retaining large customers that generate more profit, but they do not seem to work in developing new customers into larger, more profitable ones.

Keywords: customer profitability, customer-specific marketing expenses, panel data

The traditional divide between marketing and finance is disappearing. Increasingly, marketing is made financially accountable, customer profitability has become a key marketing metric, and academic research on customer equity, customer (lifetime) value, and return on marketing is burgeoning (Blattberg and Deighton, 1996; Rust et al., 2004b; Berger et al., 2006; Gupta et al., 2006). The financial analysis of marketing actions is shifting from the level of the customer segment to the level of the individual customer relationship. Kumar and Petersen (2005) have identified the elements of a customer-level marketing strategy. A core capability in such a strategy is to be able to target the right customer with the right marketing actions, such that the costs to serve a customer are in line with revenues from that customer, and profitability is enhanced.

Previous studies have investigated the profitability impact of various marketing decisions, such as frequency and method of contacting customers, differential pricing of services, channel management, loyalty programs, and customer acquisition and retention spending (Reinartz and Kumar, 2003; Campbell and Frei, 2004; Thomas et al., 2004; Venkatesan and Kumar, 2004; Kumar and Petersen, 2005). With each additional empirical study into the profitability impact of marketing actions, our insight in the causal relationships between marketing decisions and firm performance is growing. The empirical base is slightly skewed towards service providers (financial services in particular), (catalog) retailers and business-to-consumer settings. We add to the extant literature with an analysis of the impact of customer-specific marketing expenses – in this case the provision of free equipment to selected business customers – on customer retention and customer profitability. Previous work related to this type of marketing investments is either of a conceptual nature (Ghosh and John, 1999) or empirically studies its links with opportunism and commitment (Brown et al., 2000; Jap and Ganesan,

2000; Rokkan et al., 2003). In this paper, we apply survival analysis to empirically analyze the impacts of such investments on retention, and panel data analysis to analyze its impact on profitability.

The customer-specific marketing expenses we study in this paper are used as a customer relationship management tool. At the discretion of marketing management, some customers are provided with free equipment under the assumption that this will strengthen the customer relationship and improve firm profitability (Brown et al., 2000). The key question is whether these relationship-specific expenses actually create value for the supplier (Srivastava et al., 1998; Rust et al., 2004a). In other words, are the relationship-specific expenses ‘money well spent’? To analyze this, data is required on the profitability of individual customer relationships over a number of years, as well as on the marketing expenses targeted at customers. We have customer profitability data from one firm in a business-to-business setting, that allows us to track revenues, cost of goods sold, service costs, and targeted marketing expenses for more than 4,500 customer relationships over four years. The firm provides hygiene services to business customers, and it invests in customer relationships by placing free equipment (such as soap dispensers) at customer sites. We can track the impact of these targeted expenses on customer retention and customer profitability for thousands of individual customer relationships. We find that retention rates are higher for targeted customers, but this effect results from an interaction with customer size. Panel data analyses show that the impact on customer dollar profit is positive only for large customers. Thus, targeted marketing expenses seem a tool for relationship maintenance rather than customer development: they help in retaining large customers that generate more profit, but they do not seem to work in developing new customers into larger, more profitable ones.

The paper is structured as follows. In the next section we define customer-specific marketing expenses, and we draw up the research questions. Then, we present background information on our database, followed by the empirical analyses. We conclude with recommendations and limitations.

1 Customer-specific marketing expenses

Consistent with Webster (1992), we define marketing expenses as all costs made to start and maintain a customer relationship. We limit these expenses to those for which the company does not directly receive a compensation. Marketing expenses therefore include the ‘standard’ categories such as market research, sales force and advertising, but they also include acquisition costs such as free products, discounts and cash-backs, the costs of loyalty programs (e.g. frequent flyer miles), and the costs of freely available service and support (e.g. toll-free help-desks). Marketing expenses do not include product and delivery costs, or services that are offered at a market price, for example service support that is charged at full cost to the customer. The aim of marketing expenses is to generate returns in terms of customer attraction (producing cash flows from new customers), customer retention (increasing the length of the customer lifetime), and/or customer development (increasing cash flows from existing customers) (Rust et al., 2004b; Kamakura et al., 2005).

Within the category of marketing expenses, we can make a distinction between general marketing expenses and customer-specific marketing expenses. Expenses of the first type are part of the value proposition to all customers. Not all customers will make use of this offer, and for those customers that do request such a service, sales revenue or profitability is not necessarily expected to increase. For example, a customer dialing a toll-free help line which is part of her internet subscription will probably not take up more subscriptions, and a customer requiring

support from service mechanics to repair faulty equipment will not buy more equipment on the spot. Just like advertising and sponsoring, however, providing these services can improve the perceived quality of the company and its offerings. These expenses are aimed at increasing overall profitability, while accepting that the costs are not necessarily recovered from the specific customers that cause the costs.

Customer-specific marketing expenses, on the other hand, are made with the aim to increase the profitability of these specifically targeted customers. Examples of such expenses are special events organized for selected customers and the placement of assets paid for by the seller at the customer's site. Ice cream maker HB, for instance, has offered freezers free of charge to retail outlets that sell ice cream (McDowell, 1996). Expenses incurred for such selected relationships need to be recovered from that specific customer relationship. The return of these expenses should come from increased retention and/or development of existing customers. In other words, this kind of marketing activity targeted at specific customer relationships should lead to reduced customer defection and/or increased customer spending, either as a result of buying more products, or as a result of buying higher margin products (Bolton et al., 2004).

In line with Bolton et al.'s (2004) theoretical framework of customer asset management, the underlying rationale is that customer-specific marketing expenses (as one type of marketing instrument) influence customer perceptions of the relationship. These supplier-made investments in the relationship may increase customer-perceived switching costs, defined as the perceived economic and psychological costs associated with changing from one alternative to another (Jones et al., 2002). Customer-specific marketing expenses could affect all three core customer perceptions driving customer behavior as identified by Bolton et al. (2004): price perceptions, commitment, and satisfaction. To the best of our knowledge, there have not been

any empirical studies into the performance effects of this specific type of marketing instrument. Thus, we will study two questions in this paper:

1. What is the impact of customer-specific marketing expenses on customer retention?
2. What is the impact of customer-specific marketing expenses on customer profitability?

2 Data

We have access to revenue, cost, and marketing expense data for more than 4,500 customers of a company active in the hygiene industry. The company develops, markets, and services its products. It serves industrial customers, either directly or through wholesalers. It is a business unit of a large diversified firm, and the production facilities are separate cost centers within the diversified firm. It pays standard transfer prices to its production facilities. As a consequence, the actual production costs are not relevant with respect to the current research project. The products are used in a variety of settings: for example, in the kitchens of restaurants, by commercial contract cleaners, in the process installations of breweries. Depending on the application, customers receive extra advice on how to organize their hygiene, get support from service mechanics, and are sometimes offered free equipment to be used in conjunction with the hygiene products.

Some years ago, the company initiated a customer profitability project to provide more insight into costs and revenues, and help in improving the results. The added insights proved valuable and prompted the company to implement customer profitability analysis (CPA) in day to day management. The data underlying this study covers the first four years of CPA data. We include the following variables in our analyses:

- (a) revenues: the net revenue (after discounts, rebates, and bonuses) per customer.

(b) product costs: the products bought by the customer are recorded at intra-company transfer prices. As explained above, product costs cannot be influenced by the company. Product costs have no customer-specific components (no customized products).

(c) equipment: a selection of customers receive equipment free of charge. Low-cost equipment is recorded as an expense; more expensive equipment is recorded as an asset and subsequently depreciated. Relevant costs are known for each customer.

(d) service: service mechanics record the time of all visits they make to customers, and the costs of the service department are allocated based on this time.

The customer profitability numbers that result from this model are quite unique in the sense that they cover a substantial part of customer-specific costs. For example, knowing the product costs per customer allows the calculation of individual gross margins. In this respect, the model extends recent work by Reinartz and Kumar (2000; 2003) and Venkatesan and Kumar (2004), who use average gross margins in performing customer profitability analyses.

3 Empirical results

3.1 Descriptives

We have data on 4,721 different customers. Not all customers are active in every year. Table 1 shows the number of active customers in each of the four years of our study, and what proportion of active customers incurred service or equipment costs. We see that the number of customers is declining, but the proportion of active customers who incur service and/or equipment costs is increasing over the four years. On average, some 30 percent of customers are visited by service representatives, and some 25 percent of customers are targeted with free equipment.

----- Insert Table 1 -----

Product costs represent some 30 percent of sales, that is, gross margins on sales are approximately 70 percent. Average service and equipment costs are 7 and 3 percent of sales respectively, but since only a minority of customers incurs these costs, the median values of both are zero. The average customer profitability (after deduction of product costs, service costs and equipment costs) is approximately 56 percent, while the median customer profitability is about 64 percent.

3.2 The impact of targeted marketing expenses on customer retention

In Table 2 we compare, for each year, the retention rates of customers who receive equipment in that year with those who do not. We see that 75 percent of all year 1 customers are still active in year 2, but that the retention rate differs significantly between the two segments: whereas 85 percent of customers receiving equipment in year 1 record sales in year 2, only 73 percent of non-targeted customers do so. For year 2 and year 3, the pattern is the same, with customers receiving equipment showing significantly higher retention rates.

----- Insert Table 2 -----

The univariate analysis of Table 2 suggests that targeted activities lead to higher retention. However, untabulated results show a substantial correlation between customer size, targeting, and retention. To analyze the retention and defection rates of the customers, we apply survival analysis: we are interested in the question whether a customer will defect in a period. This type of analysis is often performed using a Cox proportional hazard model (e.g. Kalbfleisch and Prentice, 1980). However, because of the very limited number of periods (effectively

three because of right-censoring), applying a regular hazard analysis is not appropriate. Therefore, we use a discrete time survival model (Singer and Willett, 1991; HassabElnaby et al., 2005). We estimate the following model:

$$\text{Retain}_{i,t+1} = \beta_0 + \beta_1 \text{LnSales}_{it} + \beta_2 \text{DTarget}_{it} + \beta_3 \text{LnSales}_{it} \times \text{DTarget}_{it} \quad (1)$$

with

$\text{Retain}_{i,t+1}$ = dummy variable that takes on 1 if customer i records sales in year $t+1$ (so is retained), and 0 otherwise;

LnSales_{it} = log of sales revenue of customer i in year t ;

DTarget_{it} = dummy variable that takes on 1 if customer i is provided with free equipment in year t , and 0 otherwise;

Since we have four years of data, the information of year 4 can only be used to determine the dependent variable, $\text{Retain}_{i,t+1}$. The equation is estimated with direct effects, and with an interaction term, using a maximum likelihood logistic regression procedure. In Table 3 we present the results.

----- Insert Table 3 -----

We see that larger customers are less likely to defect. This result is consistent over both models. There is no direct effect of targeted marketing activities in a simple specification involving only customer size and targeted activities (model 1). Including an interaction term with customer size (model 2) leads to a direct effect of targeted activities on retention that is negative, but the interaction term is positive. Furthermore, including the interaction term leads to a very limited increase in explanatory power as measured by the McFadden R^2 . Thus, marketing

activities do not achieve retention as such. The apparent relation between targeted activities and retention of Table 2 results from the correlation of targeting with customer size.

3.3 *The impact on customer profitability*

Next, we study the impact of targeted marketing activities on customer dollar profitability, which we calculate as customer revenue minus direct customer costs (consisting of product, equipment, and service costs). As a first indicator, we compare two groups of customers over four years: customers who never receive equipment, and customers who always receive equipment. Table 4 shows substantial differences between these two groups: customers that always receive equipment are much larger and have much higher profits, although they do have a lower profitability margin (profit as a percentage of sales).

----- Insert Table 4 -----

To evaluate the impact of targeted marketing activities, we employ a panel data analysis. This enables us to include customer-specific intercepts, which correct for selection bias: if targeted customers are inherently more attractive, this would be captured by their individual intercepts. To arrive at a balanced panel, we select customers that record sales in all four years. This yields a total of 1,562 customers, hence the dimensions of the panel data are T=4 and N=1,562. We estimate the following empirical model for customer profitability:

$$\text{Profit}_{it} = \gamma \text{Profit}_{i,t-1} + \beta \text{DTarget}_{it} + \eta_i + \lambda_t + \varepsilon_{it} \quad (2)$$

where Profit_{it} is the customer profitability, and DTarget_{it} is the dummy variable as used in the survival equation (1). Furthermore, to control for unobserved customer-specific factors we include customer-specific effects η_i , while time effects λ_t model any relevant factors common

to all customers. Finally, we assume the idiosyncratic error term ε_{it} to be uncorrelated over time and across customers, but we allow for general heteroskedasticity patterns.

Among other things, the model above relates current customer profitability to profitability in the previous year. It can be rewritten in a form more easy to interpret, i.e.

$$\Delta\text{Profit}_{it} = -(1-\gamma)(\text{Profit}_{i,t-1} - \alpha_i) + \beta\text{DTarget}_{it} + \lambda_t + \varepsilon_{it} \quad (3)$$

with $(\gamma-1)\alpha_i = \eta_i$. Equation (3) implies that the change in customer profitability is determined by an adjustment of profitability towards a "natural" or "equilibrium" level α_i , which may be different across customers e.g. due to customer size. The speed of adjustment of customer profitability towards the 'natural' or 'equilibrium' level is equal to $(1-\gamma)$. It is to be expected that there is partial adjustment, i.e. $0 < \gamma < 1$. The effect of targeted marketing activities is measured by β . Should targeted marketing activities help in developing customer profitability, we would expect a positive sign on this coefficient.

We present estimation results of model (3) using both the level and the logarithm of profitability. In the latter case a slightly smaller sample is available ($N=1,367$) because for some customers losses have been reported. To obtain consistent estimates of the unknown parameters of model (3) the use of efficient Generalized Method of Moments (GMM) is warranted. It is well known that the least squares estimator is biased and inconsistent (for finite T and large N) in fixed effects panel data models with predetermined or endogenous regressors. A prominent example is a model with autoregressive dynamics (Nickell, 1981), such as the empirical specification above. Moreover, regarding the targeted activities dummy, it is likely that there is a lagged feedback mechanism from profitability resulting in lack of exogeneity of this regressor too. Hence, we present estimation results of the specification above using the system

GMM estimator proposed by Blundell and Bond (1998), run on the Ox version of DPD (Doornik et al., 2006). Regarding the lagged dependent variable regressor we exploit all available moment conditions arising from the model assumptions. Regarding targeted activities dummy we do not rule out the possibility of lagged feedback from profitability to targeted marketing activities. The various coefficient estimates and their estimated standard deviations are presented in Table 5. Also reported are p -values of the Sargan test of over-identifying restrictions (Sargan, 1958; Hansen, 1982), which tests the validity of both specification and moment conditions.

----- Insert Table 5 -----

We present full sample results as well as estimates from customer size-based subsamples. It is natural to expect that both profitability persistence and the impact of targeted activities depend on customer size. The latter are constructed according to the quartiles of the sales distribution in the first year. In such a way we allow for parameter heterogeneity depending on customer size.

The estimates in general show that there is positive persistence over time in customer profitability as measured by γ . Regarding β , for the full sample, targeted marketing activities have a significant positive impact. However, the Sargan p -values for the full sample are low indicating a potential specification problem especially for the logarithmic model. Among other things this may be caused by considerable parameter heterogeneity as is shown in the subsample estimates. When we contrast the smallest customers (1st quartile) with the largest, we observe that the β coefficient is small or negative, yet non-significant for the smallest customers, while this coefficient is positive but only marginally significant for the largest customers.

Sargan p -values indicate no serious specification problems for the subsamples of smallest and largest customers. Just as with the retention analysis, a substantial size effect seems present. Persistence seems to increase with customer size indicating a slower speed of adjustment for larger customers. We experimented with various alternative specifications, e.g. using a finer grid to construct subsamples or trimming the data to dismiss extreme observations. The (un-reported) results from these robustness checks show a similar pattern for the coefficient estimates as in Table 5. In all, the results suggest that targeted marketing activities do not really help in developing the profitability of customers. Since targeted customers are substantially more profitable in dollar terms (see Table 4), this points to interpreting these activities as relationship maintenance tools.

4 Conclusions

This article examines the impact of targeted marketing expenses on customer retention and customer profitability. On the basis customer-level data on sales, marketing and service for a large number of customer relationships over a period of four years in a business-to-business setting, we find that customers who are targeted with customer-specific relationship expenses show higher retention rates, and that these customers have higher sales and higher profits. However, survival and panel data analyses suggest that the targeted marketing expenses are not directly resulting in these higher retention and profitability rates. Customers receiving free equipment are generally larger, and have higher dollar profits (even while they show lower profitability margins). Survival analysis shows customer retention is related to customer size, rather than to targeted marketing activities as such. Our panel analyses show that the use of targeted marketing activities does not seem to help in developing customers with respect to profitability. In our case company, targeted marketing activities are much more a tool for

managing and maintaining relationships with large customers than for generating extra returns. Our analysis supports the idea that this kind of relationship-specific investment works as a token of commitment from the supplier to the customer (cf. Gounaris, 2005). According to Rokkan et al. (2003), such an investment can lead to a bonding effect between supplier and customer, strengthening the relationship and leading the customer to refrain from opportunistic behavior, provided that the relationship is characterized by a strong norm of solidarity. In the absence of such a strong norm of solidarity, targeted investments may lead to an expropriation effect: opportunistic expropriation of value on the part of the receiver (in our case the customer). Indications of such opportunistic behavior could be paying lower prices, or demanding more services from the supplier. Firm conclusions about whether the investments in our case lead to expropriation or bonding would require additional research, but the fact that customers who receive free equipment have significantly lower profitability margins than customers who do not receive free equipment is striking.

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Table 1 Sample characteristics. Panel A: average product, service and equipment costs, and customer profitability as a percentage of customer sales revenue. Panel B: number of active customers and the proportions of those customers incurring service or equipment costs.

Panel A	year 1	year 2	year 3	year 4
product costs	33.2	34.7	34.0	31.1
service costs	7.4	6.4	4.0	8.5
equipment costs	3.2	3.7	3.4	5.3
customer profitability	56.2	55.1	58.6	55.1

Panel B	year 1	year 2	year 3	year 4
# active customers	3112	3067	2665	2474
proportion receiving service	29.2%	31.6%	30.6%	34.1%
proportion receiving equipment	19.0%	24.8%	24.6%	27.2%

Table 2 Year-to-year retention rate of targeted versus non-targeted customers. For example, in yr1, 590 of 3112 customers received equipment; of these 590 customers, 502 recorded sales in yr2. All retention rates differ significantly between the two segments at the 1% level according to a chi-square test.

equipm	yr1	yr2	%	yr2	yr3	%	yr3	yr4	%
yes	590	502	85.1	724	571	78.9	653	524	80.2
no	2522	1837	72.8	2343	1592	67.9	2012	1356	67.4
	3112	2339	75.2	3067	2163	70.5	2665	1880	70.5

Table 3 Logistic regression on the event of retention, where the dependent variable is 1 if the customer records sales in the next year, and 0 otherwise. LnSales is the log of customer sales, DTarget is a dummy variable that is 1 if the customer receives equipment in that year and 0 otherwise. Number of observations is 8,844.

	(1)	(2)
Constant	-6.659 (.206)	-6.120 (.224)
LnSales	1.074 (.030)	0.993 (.033)
DTarget	-.097 (.074)	-3.207 (.610)
LnSales x DTarget		.443 (.087)
McFadden R^2	.203	.206

Table 4 Characteristics of customers that are active in all four years, and receive equipment in all four years (Panel A, $n = 320$), or never receive equipment (Panel B, $n = 939$). Sales and dollar profit are indexed to the overall median sales in year 1; profitability % is dollar profit as a percentage of sales. All values are significantly different between the two groups at the 1% level using a non-parametric Mann-Whitney test.

Panel A	year 1		year 2		year 3		year 4	
	mean	med	mean	med	mean	med	mean	med
sales	4720.4	670.7	4910.6	711.5	5200.3	614.8	5357.7	634.4
dollar profit	2504.6	272.6	2425.1	262.6	2534.2	256.8	2385.7	186.5
profitability %	29.6	45.0	34.3	45.3	40.9	49.7	26.3	40.7

Panel B	year 1		year 2		year 3		year 4	
	mean	med	mean	med	mean	med	mean	med
sales	662.1	158.8	654.8	172.1	714.7	163.7	683.1	147.7
dollar profit	411.6	99.0	394.0	107.9	437.1	105.7	420.4	101.5
profitability %	64.4	67.2	62.6	65.5	64.8	66.3	67.8	70.7

Table 5 GMM estimation results for profitability using a first-order dynamic panel data model including (unreported) customer-specific and year effects, for the balanced panel of customers that record sales in each of the four sample years. Dependent variable ($Profit_{it}$) is the customer dollar profit in either levels or logarithms, γ is the coefficient on the lagged profit, and β on $DTarget_{it}$ (a dummy variable that is 1 if the customer receives equipment in that year and 0 otherwise). Standard errors are in parentheses behind coefficient estimates. Panel A: results for the level of $Profit_{it}$ ($n = 1,562$), Panel B: results for the logarithm of $Profit_{it}$ ($n = 1,367$). Number of years is 4, the quartiles are ordered from smallest to largest 25 percent of customers. The last column shows p -values of the Sargan test.

Panel A	γ	β	<i>Sargan</i>
full sample	0.78 (0.17)	2,078 (1,064)	0.10
1st quartile	0.52 (0.11)	67 (128)	0.68
2nd quartile	0.27 (0.14)	31 (119)	0.35
3rd quartile	0.75 (0.20)	-360 (217)	0.00
4th quartile	0.71 (0.22)	5,925 (3,775)	0.36

Panel B	γ	β	<i>Sargan</i>
full sample	0.40 (0.06)	0.61 (0.09)	0.00
1st quartile	0.33 (0.07)	-0.07 (0.14)	0.58
2nd quartile	0.42 (0.09)	0.12 (0.08)	0.02
3rd quartile	0.55 (0.07)	0.08 (0.06)	0.05
4th quartile	0.86 (0.06)	0.11 (0.06)	0.71