Multi-unit price promotions and their impact on purchase decisions and sales

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Published in:
European Journal of Marketing

DOI:
10.1108/EJM-12-2013-0729

Publication date:
2017

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Abstract

Purpose

We compare the impact of different multi-unit promotions (MUPs) and a single-unit promotion (SUP) on store-level sales and consumer-level purchase probability and quantity decision.

Design/methodology/approach

The paper combines two empirical studies. Study 1 applies a hierarchical multiplicative model to store-level sales data for four product categories provided by a large Dutch retail chain. Study 2 presents a laboratory experiment in which the quantity requirements of the two focal MUP frames are manipulated to assess their impact on consumer purchase decisions.

Findings

We provide empirical evidence for the superiority of the "X for \$Y" above "X + N free", which confirms the hypotheses based on prospect theory, mental accounting and theory about gift giving. Quantity requirements of 4 to 5 units show the largest effects. In addition, the superiority of the "X for \$Y" frame holds for functional product categories, but not for hedonic categories.

Practical implications

We provide managerial insights into the relative effectiveness of alternative MUPs and a SUP, and how this promotional effectiveness depends on the type of product category and quantity requirements.

Originality/value

This paper combines actual sales data and experimental data. This "mixed approach" extends existing knowledge by comprehensively evaluating two MUP frames, namely "X + N free" and "X for \$Y" promotions, and a SUP.

Keywords

Sales promotions, Multi-Unit Promotions, Retailing, Price Framing.

1. Introduction

Price promotions are an attractive marketing tool because they are easily implemented and promise considerable sales increases in the short run (Bijmolt, Van Heerde, and Pieters, 2005; Van Heerde and Neslin, 2008). Especially, multi-unit price promotions (MUPs) enjoy increasing popularity for some time (e.g., TNS, 2006). MUPs offer customers a discount if a particular quantity of the promoted product is bought. MUP frames appear attractive to manufacturers and retailers, because they often have a stronger impact on volume sales than single unit promotions (SUPs), which offer a price discount per single item (Manning and Sprott, 2007).

Different MUP price frames are possible to communicate the same economic quantity discount. Several MUP price frames are commonly used, including "3 + 1 free" and "4 for $6" type of offers. Both examples include a quantity requirement of four, meaning that the discount is only given on each set of four items that is bought. The quantity requirement of MUPs can take on any value above one.

Most prior papers on price frames analyze alternative SUPs and compare, for instance, "% off" versus "$ off" promotions (e.g. Berkowitz and Walton, 1980; Chen, Monroe, and Lou, 1998; DelVecchio, Krishnan, and Smith, 2007; Gamliel and Herstein, 2012; Grewal, Marmorstein, and Sharma, 1996; McKechnie, et al., 2012; Mishra and Mishra, 2011). The literature on SUPs has demonstrated that the presentation of the discount is a major determinant of a promotion's effectiveness (Krishna, et al., 2002). The findings on SUPs may only partially transfer to differences between alternative MUP price frames. Alternative MUPs may be evaluated differently by consumers, because the frames differ in the semantic cues they prime (Raghubir 2004a, Liu and Chou 2015). Among the two examples given above, the "3 + 1 free" offer, for example, does not mention a discount or a reduced price, but emphasizes an additional unit that might appear as a free gift. This difference might affect the perceived value of the promotion (Diamond and Campbell, 1989; Kim and Kramer, 2006). Therefore, it is possible that its effects on purchase decisions differ from those of SUPs and alternative MUPs.

Thus far, only two papers (Foubert and Gijsbrechts, 2007; Wansink, Kent, and Hoch, 1998) have analyzed whether and how MUPs affect sales and these studies provide some evidence that MUPs generally are more effective than SUPs. Based on a one-week field experiment conducted with a local retailer, Wansink et al. (1998) find the "X for $Y" promotion to induce significantly larger sales effects (on average 32% higher) than a regular SUP in nine of thirteen categories. Foubert and Gijsbrechts (2007) also investigate the "X for $Y" frame and use consumer panel data to assess its effects on purchase quantity and incidence in the snack chip category. They find that effect of the MUP on SKU switching is relatively large, but the effect on category sales is much smaller. The relationship between the quantity requirement of the MUP and the purchase quantity per consumer takes the form of an inverted U, meaning that the impact of the promotion shrinks after a critical quantity requirement level. In addition, they find that promotions with large quantity requirements reduce the probability of a purchase. Although these insights are interesting, these findings are limited to one particular MUP frame ("X for $Y") and thus leave important questions regarding the differences between alternative MUPs and quantity requirements unaddressed.

Therefore, this paper aims to contribute to the literature on sales promotions in general and MUP frames in particular by examining the relative effectiveness of two MUP price frames ("X for $Y", "X + N free"). More specifically, theory and data will be used to answer the following questions: 1) Do different MUP frames differ in their effects on sales?; 2) Are these MUPs more effective than a SUP?; 3) Is the favorability of the MUPs dependent on the product category that is promoted?; 4) How do different quantity requirements affect the effectiveness of MUPs?; and 5) How are consumers' purchase and quantity decisions affected by alternative MUPs?

Differences between the MUPs may be explained by theories such as prospect theory, mental accounting and gift-giving, and we will formulate hypotheses based on these theories. The hypotheses are tested using empirical scanner data (Study 1) and data from a laboratory experiment (Study 2). Specifically, Study 1 applies a hierarchical multiplicative model to scanner data provided by a large Dutch retail chain operating more than 200 stores. It compares the sales impacts of the two focal MUPs and a SUP in four product categories and sheds light on research questions 1, 2 and 3 in a real market setting. In addition, we present a laboratory experiment (Study 2). In the experiment, the quantity requirements of the two focal MUP frames are systematically manipulated such that we are able to measure their impact on consumer responses to the alternative promotions, including consumers' purchasing likelihood and quantity decisions. Study 2 answers research questions 2 to 5.

The results of the scanner data analysis included in Study 1 show that the "X for $Y" frame outperforms the "X + N free" alternative and the SUP. It affects sales significantly more in three out of four categories, for which it leads to immediate sales increases during the promotion period that lie between 17% and 58% above the increases caused by the "X + N free" promotion, if discounts of 25% are included. The main findings of Study 2 support the superiority of the "X for $Y" promotion, where the difference is largest for medium levels of quantity requirement (four or five products) and for functional product categories (compared to hedonic categories).

The remainder of this article is organized as follows. In the next section, we discuss the relevant literature and specify hypotheses. Subsequently, we report the results of the first study, which includes a store-level scanner data analysis. Then we discuss the second laboratory study. The paper closes with a discussion of the main findings and managerial implications.

2. Theory and hypotheses on “X + N free” versus “X for $Y”

Alternative price frames are evaluated differently by consumers and, therefore, they may differ in their sales effects because the perceived promotion value influences the deal reaction (Krishna et al., 2002; Sinha and Smith, 2000; Raghubir, Inman, and Grande, 2004). Different theories shed light on a possible preference for each of the two investigated price frames: “X for $Y” and “X + N free”, the preference of a MUP above a SUP, and the role of quantity requirements. We will build our reasoning on prospect theory, the theory of mental accounting and the theory of gift-giving, and next formulate hypotheses on this theoretical basis.

According to prospect theory (Kahneman and Tversky, 1979), the different price frames are perceived as positive (gains) or negative (losses) deviations from a reference point (the reference price and/or quantity of the product), and thus it provides plausible explanations for consumer reactions to different price frames (Palazon and Delgado-Ballester, 2009; Sheng, Bao, and Pan, 2007; Sinha and Smith, 2000). A price promotion formulated in a monetary frame, e.g. “X for $Y”, would be considered as a reduction in “the loss”, because it highlights the reduction of the purchase price. A price promotion formulated in a nonmonetary frame, e.g. “X + N free”, would be viewed as a “gain” obtained in the transaction, because it highlights the increase of the quantity obtained. Prospect theory predicts that changes in the loss component have a larger impact than changes in the gain component, if gain and loss are of the same size. In this research we are focusing on the “3 + 1 free” and the “4 for $Y” (where $Y equals the price of 3 units) frame. Hence the reduction of loss in the “X for $Y” frame equals the price of 1 unit (loss: $Y/3) and the “3 + 1 free” frame also equals (the price of) 1 unit (gain: \$Y/3). As the gains and losses are of equal size in such a situation, Prospect Theory would predict that the perception of the reduced losses is stronger (steeper slope) as compared to the increase in gains, hence “X for \$Y” should outperform the “X + N free” price frame.

Thaler (1985) developed the theory of mental accounting, a descriptive alternative to the deterministic economic theory of consumer choice. Mental accounting theory incorporates compound outcomes where each outcome is measured along the same dimension (say dollars or units). The joint outcome (x,y) of a choice could be valued jointly ($v\ (x + y)$) in which case they are said to be integrated. Alternatively, they may be valued separately as $v\ (x) + v\ (y)$ in which case they are said to be segregated. Promotions that emphasize the promotion’s non-monetary benefits likely cause a segregation of the gain (Kim and Kramer, 2006). In contrast, if the MUP presents all information using the same unit, such as monetary units, encoding the promotion as a reduced loss and integrating both components is more likely (Diamond and Campbell, 1989). Kim (2006) shows that integration leads to higher purchase intentions than segregation when price perceptions are stimulus instead of recall driven as in our context. Hence, the type of a price frame determines the “mental accounting” conducted by the consumer. In particular, the “X + N free” MUP highlights segregation of the gain, i.e. the free additional unit obtained, whereas the “X for \$Y” MUP sends different signals for price and quantity: the part “for \$Y” in the “X for \$Y” frame emphasizes the integration of the reduced loss, i.e. the lower price to be paid, whereas “X” in the “X for \$Y” frame emphasizes the integration of the gain, i.e. the overall quantity received, “X”. Assuming that there is a significant share of customers who focus on price rather than quantity when facing an “X for \$Y” type of promotion, we expect that the effectiveness of the “X for \$Y” frame will be superior than the “X + N free” frame.

Thus, combining prospect theory and the theory of mental accounting, the effectiveness of "X + N free" is expected to be lower than of "X for $Y".

The literature about gift-giving (Blackorby and Donaldson, 1988) also provides indications about the effectiveness of the different price frame effects. According to standard microeconomic theory, cash is more attractive than a gift as long as the recipient does not overestimate a gift's value. Waldfogel (1993) sees gift-giving as a source of deadweight loss where gift receivers loose between 10% and 33% in perceived value as compared to receiving the same amount in cash. From the standard microeconomic theory of consumer choice, we know that the best a gift-giver can do, is to duplicate the choice that the consumer has made (Waldfogel 1993). An "X + N free" promotion therefore is a good choice of a gift, because it copies a consumer's own behavior in case of a regular (no promotion) purchase situation. However, as the recipient is well-informed about the value of the gift, it is likely that the consumer is better off if he received an equal amount of cash instead of an additional unit of the good. Therefore, the economic literature of gift-giving also predicts that price reductions like the "X for $Y" promotion are more effective as their focus is on cash-saving not receiving a gift (as in the "X + N free" promotion).

However, this view on gift-giving may be seen as problematic as not all customers are expected to behave fully rational. There are a number of interesting proposals in marketing literature about the differential effects of very low promotional prices versus the special role of gifts and zero prices (Raghubir, 2004b; Shampanier, Mazar, and Ariely, 2007; Palmeira, 2011; Palmeira and Srivastava, 2013 Mao, 2016).

Shampanier et al. (2007) find that an extra benefit is generated in situations where customers face zero prices. They experimentally test the causes of this benefit and link it to positive affect generated by the price of zero. More specifically, they argue that customers who face zero costs do not only subtract a price of zero in the typical cost-benefit calculation as positive affect generated by the zero-price additionally adds to the benefits account. In a context when they forced participants to a more cognitive instead of a more affective mode, however, the zero price effect became insignificant. The "X + N free" setting actually includes X units that have to be paid for which easily brings customers into a more cognitive mode where they carefully evaluate the overall deal. Therefore, we do not expect the sales boosting zero-price effect in our situation.

Recent findings indicate that reference dependence and attribute evaluability (Palmeira 2011, Mao 2016) may actually lead to situations where customers prefer a very small fee over a gift. More specifically, Palmeira (2011) finds that increasing price (an undesirable attribute) from zero can result in an increase in choice share as the small non-zero price offers a reference point that can help to more easily assess the attractiveness of the promotion. While at a first look Palemeira's findings suggest superiority of "X for $Y" frame, a more careful evaluation limits generalization to our context. Palmeira shows that this effect ("zero-comparison-effect") disappears when either reference points are generated by means of preliminary product choices or higher price levels are charged which make the promotion less attractive. As in our "X + N free" settings reference points are always provided by the X units that have to be paid for, we do not expect that customers have difficulties in determining appropriate reference price levels.

Mao (2016) proposes that a promotional framing of a product upgrade which charges a (very) small fee (a token such as 1 cent) could be more effective than a free gift because the small fee provides a reference point to evaluate the upgrade. Due to the very small fee of the upgrade, the upgrade is evaluated as very attractive, which leads to an overall attractive price.

Thus, the possibility of comparative evaluation in situations with a very low fee can lead to a higher sales effect than a free upgrade.

To summarize: prospect theory, the theory of mental accounting, and the theory about gift-giving all lead to hypothesis 1:

H1 Compared to the “X + N free” promotion, the “X for \$Y” promotion leads to a larger sales response.

In this study we also compare MUPs and SUPs. We will empirically test the findings of Wansink, Kent, and Hoch (1998) and Foubert and Gijsbrechts (2007) that ‘bundle promotions’/MUPs are more effective than SUPs, which means that gains of MUP are larger than the losses (have to buy more units). Hence:

H2 Compared to a single unit promotion, a multiple unit promotion lead to a larger sales response.

Chandon, Wansink, and Laurent (2000) find that non-monetary promotions work better in hedonic categories where the fun of buying and consuming the product as well as indulgence is much more important than in functional categories, where consumers are more price-sensitive. As the “X + N free” frame includes less monetary clues and highlights the benefit of obtaining an additional product, it should be more effective in hedonic categories. The “X for \$Y” frame should perform better in functional categories, based on the reasoning used for hypothesis 1. Therefore, we test the following hypothesis:

H3 a) The “X + N free” frame is more effective in hedonic product categories than the “X for \$Y” frame, and b) The “X for \$Y” frame is more effective in functional product categories than the “X + N free” frame.

In study 2, we examine the effect of alternative MUPs and a SUP on purchase probabilities and purchase quantities. The theoretical reasoning for hypothesis 1 leads to the prediction that a "X for \$Y" promotion is preferred by consumers relative to a "X + N free" promotion, in terms of their effect on purchase probabilities. In addition, both MUPs involve larger thresholds for the consumer to benefit from the promotion (larger quantity requirement for purchasing), which might lead to lower purchase probabilities relative to a SUP.

The relative effect on purchase quantities is a priori less clear. Kahneman and Tversky (1979) introduced the idea that consumers may use anchoring-and-adjustment heuristics to process information on prices and purchase quantities. Anchors may be derived from consumers' experiences (past behavior), advertised reference prices (Chandrashekaran and Grewal, 2006; Nunes and Boatwright, 2004), brand awareness (Esch et al., 2009), and prices for related and unrelated products (Adaval and Wyer, 2011) to define and adjust their internal reference points. Many other possibilities of anchoring can be found in Jung, Perfecto and Nelson (2016). In their seminal article, Wansink, Kent and Hoch (1998) document how in-store quantity information, used in MUPs, can serve as anchors, and that higher in-store anchors lead to increased purchase quantities.

The two MUP-frames are compared using the same quantity requirement and implied discount percentage. Strictly speaking we compare "(X + N) for \$Y" with "X + N free". Hence, comparable discounts of the two frames lead to different purchase quantity anchors: the anchor for the required purchase quantity is higher for "X for \$Y" than for "X + N free". And, of course, the in-store anchor is higher for both MUPs compared to the SUP, and may therefore lead to lower purchase probabilities and higher purchase quantities (Foubert and Gijsbrechts, 2007). These higher in-store anchor values may have a positive effect on consumer purchase quantity (Wansink, Kent, and Hoch, 1998). Therefore, we specify the following hypotheses:

H4 Compared to the "X + N free" promotion, the "X for $Y" promotion leads to (a) higher purchase probabilities, and (b) higher purchase quantities.

H5 Compared to a single unit promotion, a multi-unit promotion leads to (a) lower purchase probabilities, and (b) higher purchase quantities.

In Study 2, we also examine whether the relative frame effectiveness depends on the quantity requirement (X). In particular, whether the quantity requirement affects the purchase probability and purchase quantities by consumers. Both MUP frames may vary in the purchase requirement included, and therefore the anchor communicated to the consumer, e.g. "2 + 1 free" versus "4 +2 free" price frames. Wansink, Kent and Hoch (1998) demonstrate that such an increased in-store anchor leads to higher purchase quantities. However, prospect theory predicts that this effects of the quantity requirement is non-linear and levels off at a certain point. Hence, when higher requirements than 4 such as 5, 6, and 7 (see Study 2) are used, the total number of units sold remains more or less the same or even goes down. This is also illustrated in Figure 2 and discussed in Study 2. In addition, a higher quantity requirement means a higher threshold for consumers before they can benefit from the promotion, which should lead to lower purchase probabilities (Foubert and Gijsbrechts, 2007). Based on this reasoning and empirical findings by Aydinli, Bertini, and Lambrecht (2014), Foubert and Gijsbrechts (2007), and Wansink, Kent and Hoch (1998), we formulate hypotheses 6 and 7.

H6 The higher the quantity requirement, (a) the lower the purchase probability, and (b) the higher the purchase quantity.

H7 At high levels of the quantity requirement, the effect on purchase quantity becomes smaller.

3. Study 1:Assessing the effects of different frames using store-level sales data

3.1. Empirical setting

The aim of Study 1 is to shed light on research questions 1 to 3, and to test hypotheses 1 to 3 in a real market setting, i.e., whether MUPs and a SUP differ in their promotional effectiveness and explore whether these effects differ across product categories. Study 1 uses store-level scanner data to compare the effects of the two focal MUPs ("X for Y€", "X + N free") and a SUP on sales. Data pertaining to the weekly unit sales of four product categories come from a Dutch retail chain. The retailer runs more than 200 department stores in the Netherlands, with a product assortment encompassing fashion clothing, cosmetics, books, toys, food, office supplies, and consumer electronics. The retailer sells only a single private label brand per category and no manufacturer brands, offering different SKU's (size, colors) within the category. In addition, it promotes these products commonly by use of a store flyer that is distributed to households within the stores' trading areas during the week prior to the start of the included promotion. Hence, we investigate the effectiveness of store brand promotions on category sales. The promotion frames used in the flyers include the two focal MUPs as well as one SUP ("Now $Y"). The following product categories were selected for analysis: tissues, cotton pads, ring binders, and cupcakes. The cupcake category is considered more hedonic and less functional than the other three categories which are more functional (Chandon et al., 2000). All four categories employ similar price levels, and the observed promotions include similar discount levels and all state a reference price. These important similarities help to control for contextual effects that might influence promotional effectiveness across categories (Chen et al., 1998; Grewal et al., 1996; Hardesty and Bearden, 2003).

Table 1 contains an overview of the data and focal feature promotions. The weekly unit sales are available for the focal product categories at the store level over a period of approximately 16 months; from October 2005 till February 2007. Concerning the MUPs, Table 1 reveals that the retailer uses the same quantity requirement of four units ("4 for €Y", "3 + 1 free") for all but one product category. Only in the case of ring binders, we observe different quantity requirements ("2 for €Y", "2 + 1 free").

--Insert Table 1 about here--

In addition to the feature promotions, chain-wide in-store displays and store-specific temporary price cuts were used to support sales. All non-featured promotions include a discount, observable in the database, but there is no information about the price frames used during these promotions. Therefore, our analyses focus on a comparison of the sales effects of the alternative SUP and MUP price frames.

3.2. Model Development

We focus on category sales when analyzing promotional effectiveness to adopt the retailer's perspective. In this application, the alternative SKUs refer to different versions (e.g., flavors or colors) of the retailer's store brand; national brands are not available in the stores. Hence, category sales refers to the sales of all stock-keeping units (SKUs) of retailer's store brand available in the category. The focal feature promotions may increase category sales by inducing category-expansion effects (i.e., increased consumption, stockpiling, category switching, or store switching). We select category-level sales as the dependent variable and in this way account for cannibalization effects.

We control for the following characteristics which are considered major determinants of promotional effectiveness: discount level, duration of the promotion, and timing of the promotion (Kumar and Leone, 1998; Lam, Vandenbosch, Hulland, and Pearce, 2001; Van Heerde and Bijmolt, 2005; Van Heerde, Leeflang, and Wittink, 2000, 2004). We account for the duration of the promotion, because some of the feature promotions lasted for two weeks, while others lasted for three weeks. We expect that the effectiveness of the promotion is larger in the first week than in the second week, etc. We also take into account that the features under study appear throughout the year. As consumers are more receptive to offers promoting products that are currently in high demand, we also account for the timing of the feature promotions. In addition, the model accounts for variations in promotional effectiveness across stores (Ailawadi, et al., 2006; Andrews, et al., 2008) in response to heterogeneous customer bases and for all other marketing support instruments used by the retailer (price cuts and in-store displays).

The specified model has a similar structure of the well-known SCAN *PRO-model developed by Wittink et al. (1988) and has been estimated in numerous commercial applications in the United States, in Canada, in Europe, and elsewhere. The functional form of this model is a multiplicative one. In this specification the parameters are interpreted as constant elasticities and multipliers. The specification that the market responds to percentage promotional changes is consistent with theoretical arguments and empirical evidence in the behavioral literature (Thaler, 1985). The multiplicative model also implies the existence of interactions between the predictor variables. In our specification many independent variables are included as exponents (1) to facilitate the interpretation of the coefficients and (2) to account for the fact that a number of independent variables such as the promotional variables will have zero values in some time periods. The parameters of these variables should interpreted as multipliers. For example, if a multiplier takes a value of 1.5, the (category) sales are multiplied by 1.5, which means an increase of 50 percent.

Given that we assume that the effectiveness of a promotion depends on its size, its frame duration of the promotion, etc. we specify a hierarchical model. In this model the parameters itself are a function of the independent variables. Hence, effects at a "lower" level (week that the promotion is held) have an effect on the effectiveness of the promotion frame which lead to a store-specific promotion effect that ultimately has an effect on the category sales. Hence, the hierarchical multiplicative model is specified as follows:

Category sales main effect

$$(1)\quad CS_{it} = c_i \cdot \alpha_{1it}^{Promo_{it}} \cdot \alpha_2^{Lead_{it}} \cdot \prod_{j=1}^{6} \alpha_{2+j}^{Lag_{jit}} \cdot \alpha_9^{R_{it}} \cdot \prod_{k=1}^{3} \alpha_{9+k}^{Q_{kt}} \cdot Temp_t^{\alpha_{13}} \cdot Rain_t^{\alpha_{14}} \cdot e^{\varepsilon_{it}^{0}}$$

Store - specific constant

$$(2)\quad c_i = \alpha_0 \cdot \prod_{l=1}^{3} StoreSpec_{li}^{\alpha_{14+l}} \cdot e^{\rho_i^0}$$

Store - specific promotion effect

$$(3)\quad \alpha_{1it} = \gamma_0 \cdot \gamma_{1it}^{Feature_{it}} \cdot \gamma_2^{Disp_{it}} \cdot \gamma_3^{Disc_{it}} \cdot \prod_{l=1}^{3} StoreSpec_{li}^{\gamma_{3+s}} \cdot \prod_{k=1}^{3} \gamma_{6+k}^{Q_{kt}} \cdot e^{\rho_i^1}$$

Frame - specific feature effect

$$(4)\quad \gamma_{1it} = \delta_{1it}^{For_{it}} \cdot \delta_{2it}^{Free_{it}} \cdot \delta_{3it}^{Now_{it}} \cdot \delta_{4it}^{FD_{it}} \cdot \delta_{5it}^{CE_{it}} \cdot e^{\varepsilon_{it}^{1}}$$

$$\text{with}\quad (5)\quad \delta_{mit} = \lambda_{1m}^{pweek1_{it}} \cdot \lambda_{2m}^{pweek2_{it}} \cdot \lambda_{3m}^{pweek3_{it}} \cdot e^{\varepsilon_{it}^{1+m}} \qquad (m = 1\,(\text{For}), 2\,(\text{Free}), 3\,(\text{Now}))$$

$$\varepsilon_{it}^{0,..,4} \sim N(0, \sigma_{\varepsilon^{0,..,4}}),\ \rho_i^{0,1} \sim N(0, \sigma_{\rho^{0,1}})$$

for $i = 1,\ldots, I$ stores and $t = 1,\ldots, T$ weeks, where

CS_{it}	category sales in units during week *t* in store *i*;
$Promo_{it}$	indicator variable for promotion periods ($Promo_{it} = 1$ if there was a promotion in week *t* in store *i*, 0 otherwise);

$Lead_{it}$	indicator variable for lead periods ($Lead_{it}$ = 1 if week t falls in a week preceding a feature promotion at store i, 0 otherwise);
Lag_{jit}	indicator variables accounting for lag periods of up to six weeks (e.g., Lag_{1it} = 1 if week t falls in the first week before a promotion at store i, 0 otherwise);
R_{it}	number of weeks between week t and the last feature promotion in store i;
Q_{kt}	three indicator variables for the quarter of the year (e.g., Q_{kt} = 1 if week t falls in the first quarter, 0 otherwise);
$Temp_t$	average temperature in week t;
$Rain_t$	average duration of rainfall (in hours) in week t;
$StoreSpec_{li}$	variables accounting for characteristics of store i (l = 1 for the size of the store in square meters; l = 2 for the number of inhabitants in store i's trading area; l = 3 for the purchasing power index in store i's trading area);
$Feature_{it}$	indicator variable for feature promotions, with or without a display ($Feature_{it}$ = 1 if there is a feature promotion in store i and week t, 0 otherwise);
$Disp_{it}$	indicator variable for display-only promotions ($Disp_{it}$ = 1 if there is only a display and no other promotion in store i and week t, 0 otherwise);
$Disc_{it}$	average discount given in week t in store i (e.g., for a discount of 25 percent: $Disc_{it}$ = .25);
For_{it}	indicator variable for the "X for $Y" MUP price frame ($For_{it}$ = 1 if the feature in store i and week t uses a "X for $ Y" frame, 0 otherwise);
$Free_{it}$	indicator variable for the "X + N free" MUP price frame ($Free_{it}$ = 1 if the feature in store i and week t uses a "X + N free" frame, 0 otherwise);
Now_{it}	indicator variable for the "Now $ Y" SUP price frame (Now_{it} = 1 if the feature in store i and week t uses a "Now $ Y" frame, 0 otherwise);
FD_{it}	indicator variable for combined use of feature and display (FD_{it} = 1 if the feature in store i and week t was also promoted on an in-store display, 0 otherwise);
CE_{it}	indicator variable only used in the category cupcake (CE_{it} = 1 if the cupcake feature in store i and week t mentioned a special event (e.g. mother's day or queen's birthday, 0 otherwise);
$pweek1_{it}$	indicator variable for the first promotion week ($pweek1_{it}$ = 1 if week t in store i falls in the first week of the feature promotion, 0 otherwise);
$pweek2_{it}$	indicator variable for the second promotion week ($pweek2_{it}$ = 1 if week t in store i falls in the second week of the feature promotion, 0 otherwise);
$pweek3_{it}$	indicator variable for the third promotion week ($pweek3_{it}$ = 1 if week t in store i falls in the third week of the feature promotion, 0 otherwise);
$\varepsilon_{it}^0, \varepsilon_{it}^1, \varepsilon_{it}^2, \varepsilon_{it}^3, \varepsilon_{it}^4$	normally distributed error terms;
ρ_i^0, ρ_i^1	normally distributed random effects across stores.

Equation (1) describes category sales in units per week t in store i dependent on whether the observation falls into a promotion, lead or lag period and other common control variables such as the quarter of the year, weather conditions, and the recency of previous promotions (Foekens, Leeflang, and Wittink, 1999; Lam et al., 2001). Equation (1) does not include regular prices, because these prices do not fluctuate for the four categories over time. Additionally, we include a store-specific intercept, which allows for random variation in sales across the stores in accordance with major store-specific characteristics (Equation 2).[1]

The main effect of a promotion on category sales (α_{1it}) is modeled as a random coefficient allowing for store-specific heterogeneity in the response to promotions (Andrews et al., 2008). Equations 3 and 4 further specify the promotion effect and control for the relevant promotional characteristics identified above. Because response variation may be due to different population profiles and/or competitive structures in the stores' trading areas, we allow the promotion effect to interact with store-specific variables in Equation 3. First, equation 3 includes the main promotion effect which applies to all types of promotions (γ_0). Next, equation 3 accounts for the type of promotion (feature, display, or price cut (reference category)), the discount, and the time of the year. The inclusion of the promotion characteristics paves the way to separate the part of the feature-induced sales effect that is due to the particular price frame. The frame variables (MUPs: For_{it}, $Free_{it}$, SUP: Now_{it}) enter Equation 4. Equation 4 furthermore accounts for displays which were sometimes used to support the features and in the case of cupcake for a link to a special event or holiday. The week in which the promotion is held makes the different features comparable (Equation 5). Hence, the model specification disentangles the effects of the price frame and all other relevant promotional characteristics, such that it is possible to compare the effects of the alternative frames used for the communication of the feature promotions. The immediate effect (ignoring lead and lagged effects) of a feature promotion compared to a non-promotion period is determined by the coefficients associated with the store-specific promotion effect (Equation 3) and the frame-specific feature effect (Equation 4).

[1] We also tested for interactions between store characteristic and i) the type of promotions as well as ii) the type of price frame, but did not find significant effects.

The inclusion of cross-period effects in Equation 1 ensures an accurate evaluation of the total effect of a promotion, which combines sales effects before (lead), during (immediate), and after (lag) the promotional period (Ailawadi et al., 2006; Van Heerde et al., 2004) (for a discussion of lead and lag effects, see Leeflang, et al. (2015), Section 2.8). A pre-promotion dip or peak (lead effect) might emerge prior to a feature promotion as the flyers are distributed during the week preceding the promotion's start date. Accordingly, the model accounts for a lead period of one week. As the promotions stimulate consumers to buy earlier or more than usual, they can trigger a post-promotion dip. In accordance with the nature of the products, we account for a lag period of six weeks in the non-food categories and a lag period of four weeks in the case of cupcakes (compare also Van Heerde et al., 2004). Finally, we account for a possible auto-correlated error structure at the lowest level (weeks per store).

3.3. Results

We linearized the multiplicative model using a log-transformation and separately estimated it for the four categories using restricted maximum likelihood; the results of the linearized model estimations appear in Table 2. The correlations between observed and predicted category sales appear acceptable given the underlying aggregation level. Correlations lie between .56 and .81 for the within-sample predictions and between .68 and .86 for the hold-out sample predictions. Additionally, we benchmarked the proposed model against a model with pooled response estimates across the three price frames and find that the proposed model outperforms the benchmark model in terms of fit (LR-test: all $p < .001$) and predictive validity in all product categories.

-- Insert Table 2 about here –

The store and promotional effects reported in Table 2 are highly face-valid. We find positive effects on category sales for the retailer's promotions (γ_0 is positive for all categories and significant for two categories), and the promotional effect increases with the discount level (γ_3 is positive and significant for all categories). As expected, the store characteristics (store size, and size and purchasing power of the trade area) have a positive effect on category sales (Equation 2: eleven out of twelve parameters are positive and significant). However, the promotional effect is sometimes negatively affected by these store characteristics (Equation 3: five out of twelve parameters are negative and significant, seven are non-significant). The variance components show that promotional effectiveness differs across stores even after controlling for store characteristics, which suggests that response differences are influenced by store-level differences that are not available in our database. Furthermore, we find significant wear-out effects for the features in line with Van Heerde and Bijmolt (2005) (Equation 4): the estimated parameters become smaller moving from week1 to week 2 and next to week 3. Hence, feature promotions, both MUP and SUP, affect consumers' purchase and shopping trip decisions most intensively in the week directly after flyer distribution, and promotional effectiveness decreases after this first week.

Due to the wear-out effects, the effects of the two MUPs and the SUP depend on the promotion week. To assess the overall effectiveness of the feature promotions, we calculated the frame-specific overall sales impacts for a range of discount levels (corresponding to the range observed; 15 to 30 percent) as tabulated in Table 3. The immediate effect measure compares the average sales increases across two promotional weeks (typical promotion length) with a non-promotion period of the same length. The total effect measure additionally accounts for one lead and six (cupcake: four) lag weeks in comparison to a non-promotion period of the same length.

Tables 2 (Equation 4) and 3 contain decisive insights into the effectiveness of MUPs. The two focal MUP frames differ in their effectiveness. The main finding of this analysis is that the "X for €Y" promotion outperforms the "X + N free" promotion in all categories and that the difference is significant ($p < .01$, for the average two-week promotion effect) in three of the four categories. Hence, there is empirical support for Hypothesis 1. Only in the case of cupcakes, we do not find a significant difference between the MUPs.

Across all three categories (cupcakes did not include a SUP), the MUPs are superior in their promotional effectiveness than the SUP "Now €Y". This result coincides with the findings reported in previous studies (e.g., Wansink et al., 1998), which suggest MUPs cause larger sales peaks than SUPs, and supports Hypothesis 2.

The result that "X for €Y" does not outperform "X + N free" for cupcakes is in line with our expectations concerning the hedonic appeal of the category. However, the result does not confirm Hypothesis 3a, because the difference between the two MUPs is not significant. Yet, as the "X + N free" frame includes less monetary clues and highlights the benefit of an additional product, it catches up with "X for €Y" in terms of promotional effectiveness. That the economic aspects of a promotion play only a minor role in the cupcake category is also supported by the insignificance of the main discount effect and a relatively small interaction effect of the discount percentage (see Table 2, Equation 3).

In the three categories which are of more functional nature (cotton pads, ring binders, and tissues), the sales effect is larger for "X for €Y" than for "X + N free", which supports Hypothesis 3b. According to our results, "X for €Y" promotions including a discount of 25% yield immediate sales increases in the range of 249% and 356% and total effects in the range of 39% to 79% (see Table 3). "X + N free" promotions with the same discount, on the other hand, will lead to immediate sales increases between 157% and 259% and total effects between 19% and 58%. These differences are substantial for retailers and emphasize that the choice of the MUP can strongly influence whether and how successful a quantity promotion will be. If “X for €Y” is used as a price frame rather than “X + N free”, a promotion with a 25% discount results in an increased immediate sales effect in the range between 17% (cotton pad) and 58% (ring binder).

-- Insert Table 3 about here --

3.4. Summary and Limitations

Study 1 shows a consistent superiority of MUPs over SUPs in the marketplace and thus underscores their attractiveness for usage within sales promotions. Moreover, it demonstrates the superiority of the “X for €Y” over the “X + N free” frame, especially for functional products, and thus establishes the finding that alternative MUP frames differ in their sales effects. These finding constitutes a major contribution to the current knowledge on price frames in general and MUPs in particular.

However, Study 1 also raises additional questions that cannot be addressed with the available store-level scanner data. First, the retailer used only one quantity requirement level per product category. Therefore, we are not able to contrast the effectiveness of the two MUP frames across quantity requirement levels, because these do not vary within the categories and do not exceed a level of four units. It is possible that the differential effectiveness of the MUP frames changes with lower or higher quantity requirements. Second, the store-level data do not reveal whether the sales effects are due to increased purchase amounts per customer and/or due to increased numbers of customers making a purchase. Thus, the store-level data do not allow us to answer whether the “X for €Y” outperforms the “X + N free” frame because it triggers more customers to take advantage of the promotion and/or because it has a stronger effect on purchase quantity decisions. These issues are examined in more detail in Study 2.

4. Study 2: Assessing the effects of different frames using data from an experiment

4.1. Study Design

Study 2 is based on a laboratory experiment that addresses research questions 2 to 5 and to test the corresponding hypotheses 3 to 7. In particular, the aim of Study 2 is to analyse whether the results of Study 1 transfer to different quantity requirements and whether MUPs differ in their effect on purchase and quantity decisions.

Two hundred twenty-two undergraduate students enrolled at a university in the Netherlands participated in the experiment, which uses a 3 (price frame: ("X for €Y", "X + N free", "Now Y€") x 7 (quantity requirement: 1 (SUP) to 7 (MUP)) x 2 (product category: shower gel, ring binder) mixed design. Each respondent received two promotions, which differ in their price frames, their quantity requirements and the products to be promoted. The order of the price frames, quantity requirements and product categories was counterbalanced across respondents. The SUP condition serves as a benchmark to judge the effectiveness of the MUPs. We included a non-promotional control group that received two advertisements of the focal products that looked similar to the promotions but did not include any discounts. Table 4 gives an overview of the promotional treatments and the number of observations. As most respondents evaluated two promotions, the total sample size is 367 (Table 4). This sample size is sufficient for statistical testing with high power and stable parameter estimates, because the quantity requirement variable will be treated as continuous and therefore requires relatively few parameters. The discount levels are automatically determined by the "X + N free” frame. As its discount necessarily decreases with increasing levels of quantity requirements (e.g., “1 + 1 free”: 50% discount, “2 + 1 free”: 33% discount), we added two “X + 2 free” promotions to disentangle discount level and quantity requirement (“2 + 2 free”: 50% discount, “3 + 2 free”: 40% discount). The “X + N free” frame offers result in six different discount levels: 50%, 40%, 33%, 29%, 25%, and 20%. The prices of the “X for €Y” and “Now Y€” promotions were selected to match these discounts. Hence, all possible combinations of frames and discounts were included.

-- Insert Table 4 about here --

Shower gel and ring binders were chosen as products because students frequently buy them and they differ in their hedonic appeal. Moreover, the ring binder category enables us to compare the findings of Study 2 with those of Study 1. Some respondents indicated not to shop for one or both of the focal products. Observations without purchase experience have been removed from the database, resulting in a total sample of 413 observations. Three hundred sixty-seven of these are treatment observations (see Table 4), while 46 belong to the control group (not tabulated).

4.2. Procedure and manipulation check

The respondents went through two purchase scenarios, each including one promotion or no promotion for the control group. In each purchase scenario, respondents were asked to imagine that they are looking through a store flyer that was dropped into their mailbox. To avoid store preference effects, respondents were told that the store providing the flyer is one of the two shops where the respondent usually does his/her shopping and that it is located not further away from his/her home than competitive stores. Then, one of the promotions of the store flyer was presented, and respondents were advised to assume that the promoted product is one of their favorite brands and designs. The promotions made use of neutral product pictures that did not carry or resemble any of the brands in the market to avoid a brand preference bias (see Figure 1 for an example).

-- Insert Figure 1 about here --

After viewing the promotion, respondents stated i) the probability of visiting the store to take advantage of the promotion by purchasing the product, in percentage terms and ii) the purchase quantity given that the store was visited to buy the product. We forced a quantity statement (larger than zero) to ensure that we would be able to analyze how different price frames and quantity requirements affect respondents' quantity decisions. The questionnaire allowed the respondents to buy the promotional package and/or the regularly priced single unit. The intended purchase quantities for each of these options had to be stated separately (details on the scales are provided in the Appendix). Hence, respondents had the option to buy any combination of promotional packages and/or regularly priced single units. The sum of promotional and regular units yields the total purchase quantity.

Following the presentation of the purchase scenarios, respondents were asked to indicate their perceived hedonic appeal of the focal product category. Hedonic appeal was measured based on five-point multi-item scale (see Appendix). Based on the high Cronbach's alpha value (.88), we use the average item score to represent hedonic appeal of the category. Considering all treatment and control observations, the mean values of hedonic appeal reach 3.41 for shower gel and 2.06 for ring binders ($p < .01$). Hence, the manipulation check confirmed our assumption that respondents perceived shower gel as more hedonic than ring binders. Additionally, respondents evaluated statements about their usual purchase behavior, sales promotion proneness (Lichtenstein, Ridgway, and Netemeyer, 1993) and price expectations, which will serve as control variables.

4.3. Results

Descriptives. Table 5 gives an overview of average purchase probabilities and quantities across the experimental cells. Averages are taken over categories.

-- Insert Table 5 about here --

The promotion effect on purchase quantities was tested by comparing (total) purchase quantities (sum of units across promotional packages and regularly priced single units) between the MUP and SUP treatment groups and the non-promotional control group (Table 5). The comparison reveals that all promotional treatments significantly increase ($p < .05$) the intended purchase quantity ($M_{control} = 1.76$; $M_{SUP} = 2.23$, $M_{For}= 4.26$, $M_{Free}= 3.36$, where the M's are averages.). The effect applies particularly to the MUPs, which lead to significantly larger purchase quantities ($p < .01$) than control and SUP conditions, which provides support for hypothesis 5b. Furthermore, the descriptive statistics in Table 5 suggest that purchase quantity increases with the quantity requirement up to the level of six units and drops afterwards (especially for the "X for $Y" promotion), which provides initial support for Hypothesis 7.

A different picture emerges with respect to purchase probability (Table 5). The MUPs significantly increase purchase probability at a quantity requirement of two units as compared to the SUP and control condition. With increasing quantity requirements, however, the probability to respond to the MUPs decreases and falls considerably below the scores reached in the SUP and non-promotional control conditions. In line with hypothesis 5a, the purchase probabilities are lower for both MUPs (with quantity requirements of three or more) compared to the SUP, where these differences are significant for four out of ten cases and most pronounced for the requirement level of seven. These results provide support for Hypotheses 5a and 6a.

Generally, Study 2 seems to confirm the superiority of the "X for €Y" promotion previously found in Study 1 across quantity requirement levels, for purchase quantity, but not for purchase probability. However, the interpretation of these figures requires caution because important control variables have not yet been accounted for.

ANCOVA Model Results. We estimated two ANCOVA models to test the impact of the price frame and quantity requirements on purchase probability and purchase quantity, while controlling for the product category and other covariates, such as the discount percentage of the promotion, the respondent's sales promotion proneness, price expectations and usual purchase quantity and inter-purchase time. We also included a quadratic term of the quantity requirement in the analysis of purchase quantity. To examine whether the differential effectiveness of the two MUPs depends on the product category (research question 3) and on the quantity requirement (research question 4), we allow for interactions between price frame and product category (*SG* = shower gel) as well as between price frame and quantity requirement (*QR*). The parameter estimates which are based on the 290 MUP-treatments appear in Table 6.[2]

[2] The "X + N free" frame (*Free*) serves as a reference category for the main effect of the type of promotion. In addition, to simplify the interpretation of the context-specific MUP effectiveness in the interaction model, we include the quantity requirement (*QR*) and category (*SG*) effects for both frame variables (*Free* and *For*) separately, and exclude the redundant main effects of quantity requirement (*QR*) and category (*SG*).

The MUPs do not differ significantly in their main effects on purchase probability (β_{For} = 2.31, p = .83) and purchase quantity (β_{For} = -1.90, p = .48). Hence, we find no empirical support for the main effects presented in Hypotheses 4a and 4b. However, some of the interaction effects with quantity requirements and product category are significant.

The results reveal that the way in which a quantity requirement is presented makes a difference in terms of the effects on our objective variables. With respect to purchase probability, we find a negative quantity requirement effect, which is slightly larger in the case of the "X + N free" frame ($\beta_{QRxFree}$ = -3.82, p = .02) than for the "X for €Y" frame (β_{QRxFor} = -2.76, p = .10). This finding supports Hypothesis 6a.

With regard to purchase quantity, we find a positive quantity requirement effect which is larger for "X for €Y" promotions (β_{QRxFor} = 1.96, p = .04 vs. $\beta_{QRxFree}$ = .68, p = .46). Furthermore, this effect holds only up to a certain point, as indicated by the quadratic terms which show a steeper decline for "X for €Y" promotions (β_{QR^2xFor} = -.17, p = 09 vs. β_{QR^2xFree} = -.03, p = .77). However, the linear and quadratic *QR* effects on purchase quantity are not significant for "X + N free" frame. Hence, we find partial support for Hypotheses 6b and 7.

To facilitate interpretation of interrelated effects, Figure 2 shows the predicted relationships between quantity requirements and the dependent variables (Table 6), and how these differ between the price frames. In the case of the smallest quantity requirement (two units), the response to the two MUPs is highly similar. The largest differences in promotional effectiveness between "X for $Y" and "X + N free" are reached at quantity requirements of four and five units, which confirms our earlier findings. For quantity requirements above 6, the purchase quantity tends to go down for the "X for $Y" promotion (Table 5 and Figure 2).

-- Insert Table 6 about here –

-- Insert Figure 2 about here --

In addition, Table 6 shows that the experiment partially supports Hypothesis 3 concerning the category-specific performance of the two MUPs. In particular, we observe a significant interaction between the price frame and the product category in the purchase probability model. The effect of the "X + N free" offer on purchase probability is considerably greater, namely 11.29 on the 0 to 100 scale (see Appendix A), in the shower gel category, which is more hedonic, than in the ring binder category, which is more functional ($\beta_{SGxFree}$ = 11.29, *p* = .06). However, for the "X for \$Y" promotion, the difference between both categories is not significant and even in the wrong direction, (β_{SGxFor} = 7.05, *p* = .23). Furthermore, we find no significant differences between both MUPs in terms of their effect on purchase quantities. Hence, we find some support for Hypothesis 3a, but not for 3b.

Additional validation check. The ring binder category is part of Study 1 and Study 2. To compare the results across the two studies, we repeated the ANCOVA model of purchase quantity based on the MUP and control observations for ring binder of Study 2 only (N = 166, F = 9.45, *p* < .01). We assume a quantity requirement of three and apply a discount of 25%; the other explanatory variables are fixed at the average values. Next, we use the estimated ANCOVA model parameters to compute how intensely the two MUPs increase purchase quantities as compared to non-promotion situations. The sales increases predicted based on Study 2 ("X for €Y": 195.2%, "X + N free: 117.6%) are comparable to those predicted in Study 1 for a discount of 25% (Table 3: "X for €Y": 248.8%, "X + N free: 157.4%). The effect of a "X for €Y" promotion exceeds that of a "X + N free" promotion by 66% (Study 2) and 58% (Study 1). This similarity underscores the validity of the experimental data used in Study 2.

4.4. Summary

The results of Study 2 generalize the findings of Study 1 insofar as they show that the "X for €Y" outperforms alternative "X + N free" promotions in terms of purchase quantity, if quantity requirements above two units are used. In addition, the purchase quantities are higher for the MUPs than for the SUP. Furthermore, the results reveal the purchase probabilities tend to go down with increasing quantity requirements, whereas the purchase quantities tend to go up, which is consistent with Wansink et al. (1998). The effect of quantity requirements for the "X for $Y" frame is non-linear and levels off after about a requirement of 4 or 5 products. This finding corresponds to the results of the study by Foubert and Gijsbrechts (2007). As a consequence, difference in purchase quantity between the "X for €Y" and "X + N free" promotions is highest for medium quantity requirements. With respect to the effects on purchase probability, the "X + N free" frame performs significantly better for hedonic categories. As the "X + N free" does not mention a price but instead pretends to include a free gift, it appears less monetary-focused than the "X for €Y" alternative. Chandon et al. (2000) show that consumers consider the fun of buying and consuming as well as indulgence as more important in hedonic than in functional categories, where they are more price-sensitive. That is why non-monetary promotions work better in hedonic categories. Our results show that this principle transfers to the context of MUPs.

5. Discussion

5.1. Conclusion and Implications

Previous literature has concentrated either on SUPs alone or on only one type of MUP. Therefore, important questions have remained unaddressed concerning alternative MUPs. This research uses store-level sales and experimental data to compare the impact of two MUPs on sales, purchase likelihood, and purchase quantity, and empirically test hypotheses derived from theory (see Table 7). This, this article uses a mixed approach: we combine empirical evidence from a field study and an experiment (Wedel and Kannan, 2016). Across the two studies, we show that the “X for €Y” frame significantly outperforms the “X + N free” alternative. This finding constitutes a major contribution to the current knowledge on price frames in general and MUPs in particular.

-- Insert Table 7 about here –

The superiority of the “X for €Y” frame is dependent of the product category and quantity requirement. In the case of hedonic product categories, we observe that the “X + N free” frame can catch up in terms of its sales effect (Study 1, cupcake) which is due to a stronger effect on purchase probability in this type of category (Study 2, shower gel). Furthermore, the difference between both MUP frames is very small if the purchase requirement is only 2, is at its maximum around 4 or 5 products, and becomes very small again if the requirement becomes 7.

Our findings are largely in line with our expectations based on theory (Table 7). In addition, some of our results can be compared with existing literature (Foubert and Gijsbrechts, 2007; Wansink, et al 1999) and these results are consistent with findings of previous studies. For example, Foubert and Gijsbrechts (2007) examined the effects of (bundle) promotions on purchase incidence, purchase quantity, product choice at the brand level, whereas we examine the effect at the category sales level (because the store only sells store brands). Yet, the findings on the effects of MUPs versus SUPs and the effects of quantity requirements are highly similar across both studies with different empirical conditions.

As this research emphasizes the superiority of MUPs over SUPs, we recommend marketers to increasingly make use of this type of promotion. Specifically, they should use “X for €Y” frames to communicate their discounts, especially when promoting functional products and using quantity requirements above two units. When a purchase quantity of two units is used, consumers respond similarly to both frames so that they promise similar sales effects. However, retailers can significantly improve the success of their promotions by using higher quantity requirements, where the positive relation between the quantity requirement and effectiveness likely vanishes after a certain point. Therefore, marketers need to carefully assess alternative quantity requirements to optimize the effectiveness of their promotions. In addition, retailers may prefer some differentiation in their promotion frames and use the "X + N free" – frame also for more functional product categories. Note that the retailer we considered in Study 1 uses both frames. Framing a promotion as a gift "X + N free" could also result in higher loyalty towards the retailer and hence higher overall effectiveness as compared framing to promotion as a price reduction. This corresponds to the social rather than the economic aspect of gift-giving.

5.2. Further Research

Besides answering important questions about the effectiveness of MUPs, this study also emphasizes several interesting starting points for further research. First, the analyses are limited to data from the Netherlands. It would be interesting to determine whether the results generalize to other product categories, retailers, markets, and countries. Second, research should investigate the promotional effectiveness of additional MUPs, such as, for example, "Buy 2, get 3" and "Buy X, and get Y% off" formats, to increase our knowledge of MUPs and the implications for marketing managers. Third, consumer heterogeneity may exist in reactions to different price frames. A consumer panel data study might investigate how intensely and how (e.g., time versus quantity acceleration, brand versus store switching) customer segments react to the different MUPs. These insights may help retailers and manufacturers choose price frames that best fit their target groups. Fourth, it would be interesting to see whether the usage of a particular promotion frames affects retail brand image. For example, the "X+N free" promotion may have positive effects on consumer attitudes and emotions, and thereby strengthen the relationship with the retailer. In addition, using a new and innovative promotion type might help differentiating the retailer. If such effects exist, they should be included in the evaluation of alternative promotion frames. Fifth, other studies may consider alternative metrics such or revenues and profits as criterion variables.

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Table 1. Observations and feature promotions (Study 1)

	Cotton Pad			Cupcake		Ring Binder			Tissue		
	MUP		**SUP**	**MUP**		**MUP**		**SUP**	**MUP**		**SUP**
	X for €Y	X+1 free	Now €Y	X for €Y	X + 1 free	X for €Y	X + 1 free	Now €Y	X for €Y	X + 1 free	Now €Y
Quantity requirement	4	4	1	4	4	2	3	1	4	4	1
Mean discount	25%	25%	19%	32%	25%	26%	33%	25%	20%	25%	28%
# of observations	1596	2395	801	2502	1774	1283	2896	514	530	1056	1062
						1283					
Observations											
First week	October 3rd., 2005			October 3rd., 2005		October 3rd., 2005			October 3rd., 2005		
Last week	February 3rd,. 2007			February 3rd., 2007		February 3rd., 2007			September 9th., 2006		

MUP = multi-unit promotion, SUP = single-unit promotion

Table 2. Results for the linearized hierarchical model (Study 1)

Variable		COTTON PAD Coefficient	SE	CUPCAKE Coefficient	SE	RING BINDER Coefficient	SE	TISSUE Coefficient	SE
Main effects (Equation 1)									
Lead		.19 **	(.01)	.09 **	(.01)	.10 **	(.03)	.04 *	(.02)
Lag1		-.14 **	(.02)	-.24 **	(.03)	-.35 **	(.07)	-.07	(.07)
Lag2		-.15 **	(.02)	-.21 **	(.03)	-.31 **	(.07)	.00	(.06)
Lag3		-.17 **	(.02)	-.15 **	(.04)	-.17 **	(.06)	.04	(.05)
Lag4		-.12 **	(.02)	-.24 **	(.04)	-.40 **	(.05)	-.05	(.04)
Lag5		-.10 **	(.02)			-.38 **	(.04)	.04	(.03)
Lag6		-.09 **	(.02)			-.25 **	(.03)	.00	(.03)
Recency		-.04 **	(.00)	.02 **	(.00)	-.08 **	(.01)	-.01	(.01)
Quarter1		-.03	(.02)	.17 **	(.02)	.20 **	(.02)	-.09 **	(.02)
Quarter2		.09 **	(.02)	.19 **	(.03)	-.30 **	(.03)	-.16 **	(.02)
Quarter3		.10 **	(.02)	-.21 **	(.03)	.04	(.04)	-.12 **	(.02)
Temperature		-.01 **	(.00)	.00	(.00)	-.02 **	(.00)	.00 **	(.00)
Rainfall		.00	(.00)	-.02 **	(.00)	.03 **	(.00)	-.01 **	(.00)
Store-specific constant (Equation 2)									
Constant		-28.14 **	(3.12)	9.54 *	(4.18)	-24.97 **	(3.92)	-34.71 **	(3.26)
ln(sqm)		1.18 **	(.05)	.99 **	(.13)	1.12 **	(.07)	1.02 **	(.06)
ln(# inhabitants)		.28 **	(.03)	.19 **	(.04)	.40 **	(.04)	.34 **	(.04)
ln(purchasing power)		4.47 **	(.71)	-2.85 **	(.95)	3.56 **	(.89)	5.94 **	(.74)
Store-specific promotion effect (Equation 3)									
Main Effect		2.18	(1.61)	1.54	(1.47)	5.49 **	(1.70)	5.16 **	(1.24)
Display only								.06	(.08)
Discount		4.75 **	(.18)	1.00 **	(.08)	1.50 **	(.33)	4.00 **	(.17)
ln(sqm)		.00	(.03)	.05	(.05)	-.15 **	(.03)	-.06 **	(.02)
ln(# inhabitants)		-.02	(.02)	-.01	(.02)	-.08 **	(.02)	-.02	(.01)
ln(purchasing power)		-.39	(.37)	-.37	(.34)	-.76 *	(.39)	-.99 **	(.28)
Quarter1		.18 **	(.03)	-.03	(.03)	.37 **	(.04)	.12 **	(.03)
Quarter2		-.02	(.03)	-.12 **	(.03)	.16 **	(.05)	.22 **	(.03)
Quarter3		.18 **	(.04)	-.02	(.03)	.75 **	(.05)	-.04	(.03)
Frame-specific feature effect (Equation 4)									
X for Y€: pweek1		.23 **	(.03)	.24 **	(.04)	.90 **	(.07)	.76 **	(.09)
X for Y€: pweek2		-.44 **	(.04)	.17 **	(.04)	.55 **	(.09)	.10	(.10)
X for Y€: pweek3						-.27 **	(.10)		
X + 1 free: pweek1		.15 **	(.04)	.28 **	(.04)	.62 **	(.10)	.56 **	(.09)
X + 1 free: pweek2		-.62 **	(.04)	.10 **	(.04)	.21 **	(.10)	-.22 **	(.09)
X + 1 free: pweek3				-.25 **	(.05)	-.08	(.10)		
Now Y€: pweek1		-.23 **	(.05)			.06	(.09)	-.29 **	(.10)
Now Y€: pweek2		-.43 **	(.05)			-.45 **	(.11)	-.59 **	(.10)
Now Y€: pweek3		-.73 **	(.05)						
Feature-Display				-.01	(.02)	.51 **	(.05)		
Cupcake: Event				.13 **	(.03)				
Variance Components									
Level 1:	$\sigma_{\varepsilon 0}$	.55	(.00)	.50	(.00)	.80	(.00)	.42	(.00)
Level 2: constant	$\sigma_{\rho 0}$	.40	(.02)	.46	(.02)	.49	(.02)	.43	(.02)
Level 2: promotion	$\sigma_{\rho 1}$	.16	(.01)	.11	(.01)	.00	(.00)	.10	(.01)
Autocorrelation									
ϕ^1		.30	(.01)	.36	(.01)	.10	(.01)	.07	(.01)
Model Fit									
Log restricted-likelihood		-14849.3		-9339.2		-20715.0		-7625.8	
Wald test statistic		10841.1 **		3909.1 **		10122.9 **		12747.4 **	
Correlation of predicted and observed values									
Within sample		.79		.56		.69		.81	
Out of sample[a]		.86		.80		.68		.83	

Note: Estimation results are based on the linearized model.

[a]Holdout samples consist of three stores representing low, medium and high sales levels.

Significance levels: *$p < .05$; **$p < .01$

Table 3. Predicted category sales increases for different promotions (Study 1)

	Discount	X for Y€ Immediate effect	X for Y€ Total effect	X + 1 free Immediate effect	X + 1 free Total effect	Now Y€ Immediate effect	Now Y€ Total effect
Cotton Pad	15%	150,6%	21,9%	123,2%	15,8%	90,1%	8,5%
	20%	217,7%	36,8%	183,0%	29,1%	141,0%	19,8%
	25%	302,9%	55,8%	258,8%	46,0%	205,6%	34,1%
	30%	410,9%	79,8%	355,0%	67,3%	287,5%	52,3%
Cupcake	15%	46,4%	3,8%	45,0%	3,4%		
	20%	53,9%	6,0%	52,4%	5,5%		
	25%	61,7%	8,2%	60,1%	7,8%		
	30%	70,0%	10,6%	68,3%	10,1%		
Ring Binder	15%	200,2%	28,0%	121,5%	10,5%	21,4%	-11,7%
	20%	223,6%	33,2%	138,8%	14,4%	30,8%	-9,6%
	25%	248,8%	38,8%	157,4%	18,5%	41,0%	-7,3%
	30%	276,0%	44,9%	177,4%	23,0%	52,0%	-4,9%
Tissue	15%	205,5%	45,8%	140,9%	31,4%	22,9%	5,2%
	20%	273,1%	60,8%	194,2%	43,3%	50,1%	11,3%
	25%	355,6%	79,1%	259,3%	57,7%	83,3%	18,6%
	30%	456,4%	101,5%	338,7%	75,4%	123,8%	27,6%

Table 4. Experimental design of Study 2

	Quantity requirement (QR) 1	2	3	4	5	6	7	# of treatment obs.
Now Y €	Now €Y_{1a} .... Now €Y_{1f}							77
X for Y €		2 for €Y_2	3 for €Y_3	4 for €Y_{4a} 4 for €Y_{4b}	5 for €Y_{5a} 5 for €Y_{5b}	6 for €Y_6	7 for €Y_7	144
X + n free		1 + 1 free	2 + 1 free	3 + 1 free 2 + 2 free	4 + 1 free 3 + 2 free	4 + 2 free	5 + 2 free	146
Discount level(s)	all	50%	33%	25%, 50%	20%, 40%	33%	28,6%	
# of obs.	77	39	32	77	68	38	36	367

Note: For each level of quantity requirement, the reduced price levels (Y_{QR}) of the "X for €Y" and "Now Y€" promotions were selected to match the discounts determined by the "X + n free" promotions. Discounts included: 50%, 40%, 33%, 29%, 25%, and 20%.

Table 5. Descriptive statistics Study 2

		Quantity Requirement	Purchase Probability [%]	Purchase Quantity
Control	no promotion		58,78	1,76
SUP	Now €Y		64,91	2,23 [a]
MUP	X + N free	2	74,85 [a,b]	2,70 [a]
		3	62,37	2,84 [a,b]
		4	55,18 [b]	3,50 [a,b]
		5	49,13 [b]	3,58 [a,b]
		6	62,22	3,83 [a,b]
		7	39,50 [a,b]	3,50 [a]
	X for €Y	2	77,79 [a,b]	3,32 [a,b]
		3	59,62	3,69 [a,b]
		4	61,36	4,28 [a,b]
		5	66,89	4,84 [a,b]
		6	56,25	4,95 [a,b]
		7	44,06 [a,b]	3,56 [a]

Cell entries correspond to group means across product categories.
SUP = single-unit promotion, MUP = multi-unit promotion
[a] significant different from control group at $p < .1$ or better.
[b] significant different from SUP group at $p < .1$ or better.

Table 6. Effects on intended purchase behavior

	Purchase Probability			Purchase Quantity		
	Coefficient		*p*-value	Coefficient		*p*-value
For	2,31		,83	-1,90		,48
Discount [%]	,52	**	< .01	,05	**	,02
Interactions with Quantity Requirement (QR)						
QR_x_For	-2,76		,10	1,96	**	,04
QR^2_x_For				-,17	*	,09
QR_x_Free	-3,82	**	,02	,68		,46
QR^2_x_Free				-,03		,77
Interactions with Product Category						
SG x For	7,05		,22	,38		,53
SG x Free	11,29	*	,06	,18		,77
Control variables						
Sales promotion proneness	4,27	**	,02	-,08		,65
Usual purchase quantity	5,88	**	< .01	1,29	**	< .01
Usual inter-purchase time	-,35		,84	-,09		,62
Price expectation (€)	,91		,62	-,14		,48
Constant	26,68		,10	-1,98		,45
F-value (*p*-value)	6,62 (< .01)			8,025 (< .01)		
adj. R^2	.16			.23		

Note: For = "X for €Y", Free = "X + N free", QR = quantity requirement, SG = shower gel
Significance levels: ** p<.05; * p<.10.

Table 7. Results of the Hypothesis Testing

	Hypothesis	Empirical Result
1	Compared to the "X + N free" promotion, the "X for \$Y" promotion leads to a larger sales response.	Supported (for functional products)
2	Compared to a single unit promotion, a multiple unit promotion lead to a larger sales response.	Supported
3a	The "X + N free" frame is more effective in hedonic product categories than the "X for \$Y" frame.	Supported (for purchase probabilities)
3b	The "X for \$Y" frame is more effective in functional product categories than the "X + N free" frame.	Supported (for category sales)
4a	Compared to the "X + N free" promotion, the "X for \$Y" promotion leads to higher purchase probabilities.	Not Supported
4b	Compared to the "X + N free" promotion, the "X for \$Y" promotion leads to higher purchase quantities.	Supported (for intermediate quantity requirements)
5a	Compared to a single unit promotion, a multi-unit promotion leads to lower purchase probabilities.	Supported (for quantity requirements larger than 2)
5b	Compared to a single unit promotion, a multi-unit promotion leads to higher purchase quantities.	Supported
6a	The higher the quantity requirement, the lower the purchase probability.	Supported
6b	The higher the quantity requirement, the higher the purchase quantity.	Supported
7	At high levels of the quantity requirement, the effect on purchase quantity becomes smaller.	Supported (for "X for \$Y" promotions)

Figure 1.

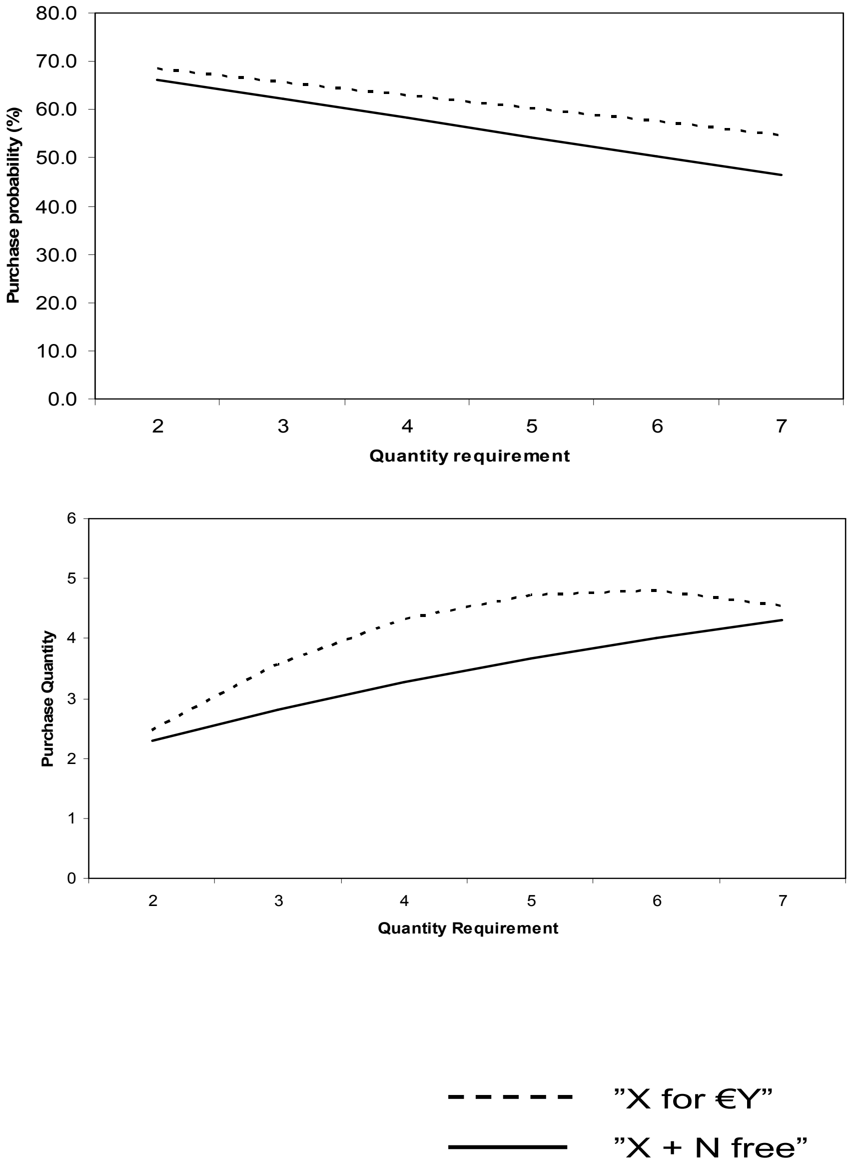
Please consider the following situation. You are looking through a store flyer that was dropped into your mailbox. The store providing the flyer is one of the two stores where you usually do your shopping. The flyer contains the following offer. Imagine that it promotes your favorite shower gel / ring binder brand.

Description of mock flyers below:

Includes image of shower gel bottle and offer: 4 for 4€ (Regular price 2€ per item)

Includes image of ring binder and offer: 3 +1 free (Regular price 3€ per item)

Figure 2. Predicted partial relationships:
MUP effectiveness across quantity requirements



Appendix

Measure	Items	Based on	Cronbach's Alpha
Hedonic appeal product category X	How would you evaluate the usage of X? No fun/fun Not delightful/delightful Not pleasant/pleasant Not sensuous/sensuous Dull/exciting Scale: five-point bipolar scales	Crowley, Spangenberg, and Hughes (1992)	α = .88
Sales promotion proneness	If a product is on sale, that may be the reason for me to buy it. I have favorite brands, but most of the time I buy the brand that is on sale. Compared to most people, I am more likely to buy brands that are on sale. One should try to buy brands that are on sale. Scale: 1 = fully disagree … 5 = fully agree	Lichtenstein, Ridgway, and Netemeyer (1993)	α = .76

Intended purchase behaviour	
Purchase probability	*(After reading the storyline and facing the promotion)* Consider you ran out of X and that you are planning a shopping trip during the next few days. How likely is it that you make this purchase at this store? Please provide a percentage figure (0% = not likely at all, … ,100% = very likely).
Purchase quantity	Please assume now that you have already decided to buy the promoted X and are now thinking of how many items to buy. You are free to choose between the promotional package ("X for €Y" or "X + Nfree"), the regular single unit (Y € per item) and any combination of the promotional package and the regular single unit. Fill in the fields below the numbers of promotional packages and regular single units that you would buy.

Usual purchase behaviour	
Usual purchase quantity	Think of purchasing X. What quantity would be typical for you (per purchase)? (quantity statement)
Usual inter-purchase time	How often do you shop for X? (1 = once a week, ..., 6 = less than every 3 months)
Price expectation	Think about a usual shopping trip. What regular price would you expect for X? (€ statement)