

The Effect of Permanent Product Discounts and Order Coupons on Purchase Incidence, Purchase Quantity, and Spending

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The effect of permanent product discounts and order coupons on purchase incidence, purchase quantity, and spending

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Abstract

This paper examines the influence of a permanent discount strategy on customer purchase behavior, i.e., purchase incidence in each week, purchase quantity (in units), and total order spending (in CNY). Permanent discounts are defined as discounts continuously provided by retailers. We identify two types of permanent discounts, namely, product-specific price discounts (PD) and order coupons (OD, which can be redeemed for a total order). We collect transactional data from a Chinese online retailer and empirically examine the effects of the two types of permanent discounts and customers' expectations of PD and OD. We find nonlinear relationships between permanent discounts and customer purchase behavior. PDs negatively influence spending when they are lower than 19% but show a positive effect beyond this threshold, hence depicting a U-shaped relationship. They also affect purchase quantity positively but at a decreasing rate. Customer expectations of PD influence purchase incidence, spending, and purchase quantity following a U-shaped pattern with a positive influence appearing when PD expectations are high than 31%, 27%, and 18% respectively. On the other hand, ODs influence spending and purchase quantity positively at an increasing rate. Customer expectations of OD influence purchase incidence, spending, and purchase quantity following a U-shaped relationship where the positive influence on purchase incidence shows beyond OD expectations of 426 CNY, and the positive effect appearing on spending and purchase quantity when these expectations are higher than 34 CNY. We also find that customer expectations of discounts interact with current discount levels in their influence on spending. Combining these results and considering that order coupons negatively affect the profit margin of the total basket, we suggest that retailers should offer order coupons with relatively low value but product-specific price discounts with high discount depth.

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Keywords: Digital channels; Permanent discounts; Product-specific price discounts; Order coupons; Customer spending

Global digital commerce amounted to \$2.79 trillion in 2019 and is expected to exceed \$4 trillion in 2024 (Statista 2020). China in particular “is already more digitalized than many observers appreciate. China is one of the world’s largest investors and adopters of digital technologies and is home to one-third of the world’s unicorns” (Woetzel et al. 2017, p. 3). Digital commerce in China accounts for more than 40% of all digital transactions, prompting massive competition among online retailers (The Economist 2017). Although more than 2600 online

retailers compete in this market (ChinaZ.com 2018), the top three digital retailers in China (Alibaba, JD.com, and PinDuo-Duo) account for nearly 80% of total retail sales (eMarketer 2018). Accordingly, many online retailers fail, and an estimated 90% operate at a deficit (iResearch 2013).

For small and medium-sized digital retailers, the struggle to survive drives them to look for ways to attract customers, often relying on permanent discounts for all their products for every customer. Arguably, customers enjoy deals, and it has been shown that discounts generally increase website traffic and purchase intention (e.g., Gong, Smith, and Telang 2015). To determine whether this strategy is effective (and efficient), we explicitly consider how two different types of permanent discounts, provided continuously by retailers in digital channels,

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influence customer purchasing behavior: product-specific price discounts and order coupons. A product-specific price discount is offered only when purchasing a particular product, whereas an order coupon is not restricted to a specific product but can be redeemed for a whole order. These two types of discounts are widely used in digital retailing, especially in China. For example, online stores on the Taobao platform routinely provide a discounted price for a product (i.e., product-specific price discount), as well as discount events such as “Spend 300 Chinese yuan (CNY) and get a 30 CNY coupon” (i.e., the 30 CNY coupon can be redeemed against the current order; in some discount events, coupons can be used without any limitations). In the latter case, the 30 CNY coupon is not assigned to a specific product but can be redeemed against the whole order. This paper compares product-specific price discounts (for example, when a product with the regular price of 100 CNY is offered at a discounted price of 90 CNY) with “amount-off” order coupons (for example, a coupon that gives 10 CNY off, with or without spending conditions) that are provided continuously.

Most previous studies discuss temporary discount strategies in traditional channels, such as brick-and-mortar stores (e.g., Gedenk and Neslin 1999; Horváth and Fok 2013; Srinivasan et al. 2004). The present paper aims to add to this research by addressing the following three aspects. First, in our study, we compare different discount strategies in a *digital context*. Searching and comparing prices (and/or discounts) is easier and requires less effort from consumers in digital channels than in physical stores (e.g., clicking to different websites vs. traveling to different offline stores; Raghuram 2004). Many retailers even provide automatic price comparisons within their digital channels. The stimulating effect of discounts on customer spending may thus be weaker in digital channels than in traditional channels, because consumers can easily find (or expect to find) better deals at exceptionally low search costs (Reibstein 2002). Although several studies have looked at digital discounts in different contexts, including the cross-channel effects of online discounts (Breugelmans and Campo 2016; Gong, Smith, and Telang 2015) and the effects of mobile discounts on purchasing (Fong, Fang, and Luo 2015), yet little is known about emerging digital discount strategies such as providing online permanent discounts.

Second, our current knowledge of discounts mainly concerns temporary discounts offered during a limited time period (e.g., Neslin and van Heerde 2009). However, when exposed to frequent (or even permanent) price discounts, consumers develop *discount expectations* and may purchase only if a product is on discount (Kalwani and Yim 1992). Hence, if a retailer provides permanent price discounts for a large part of its offering, consumers learn from their experience of observing discounts and purchasing with them (Grewal et al. 2010) and may believe that discounts will always be available. They will develop discount expectations based on their observations and experiences, and this may influence their responses to current discounts. Thus, it is questionable whether research findings from studies on temporary discounts can be generalized to permanent discounts. Therefore, in the present paper, we analyze and compare the effects of two different *permanent* discount types.

Third, most studies discuss how *product-specific price discounts* influence customer spending behavior (e.g., Biswas et al. 2013; Fong, Fang, and Luo 2015), and some papers focus on the effects of product line-specific and product category-specific price discounts on spending (e.g., Jia et al. 2018; Hui et al. 2013). Nevertheless, research on other types of discounts is scant. For instance, offering order coupons, a discount strategy recently applied by B2C retailers and/or platforms such as Taobao, is widely neglected in current research. Hence, the present paper will analyze *order coupons* that are not restricted to a specific product (or a product line or category). In our context, similar to Jia et al.’s (2018) statement for product line-specific price discounts, consumers decide not only whether to redeem the coupon but also which product(s) to buy with the coupon. This may lead to different total basket spending amounts across customers who have different choices of product combinations relative to product-specific price discounts. The latter mainly induce customers to purchase the discounted products. Therefore, this study bridges another research gap by examining the effect of order coupons on customer purchase behavior and by identifying potential differences in the effects of product-specific discounts.

In sum, we seek to address four salient research questions:

- (1) What are the effects of permanent product-specific price discounts in digital channels on customers’ purchase incidence in each week as well as their total spending (in CNY) and purchase quantity (in units) for each placed order?
- (2) What are the effects of permanent amount-off order coupons in digital channels on customers’ purchase incidence in each week as well as their total spending (in CNY) and purchase quantity (in units) for each placed order?
- (3) What are the effects of customers’ discount expectations on customers’ purchase incidence in each week as well as their total spending (in CNY) and purchase quantity (in units) for each placed order?
- (4) Do customers’ discount expectations also influence customers’ responses to current discounts?

By answering the above questions, we are able to provide insights into whether a permanent discount strategy leads consumers to spend more or less and whether product-specific price discounts influence customer purchasing behavior differently compared to order coupons. We propose a conceptual framework to detail possible mechanisms by which the two types of discounts affect customer purchase behavior. To test our propositions, we rely on data from a Chinese e-commerce retailer that sells through online and mobile channels. The data include information about all orders by 3866 unique customers from January 1–December 31, 2015. We observe two types of discounts: product-specific price discounts and amount-off order coupons. To test the effects of both discount types on consumers’ purchase incidence as well as their purchase quantity and spending for each placed order, we formulate a simultaneous equation system that corrects for the potential endogeneity bias caused by the firm’s discount strategy implementation.

We find that permanent product-specific price discounts and amount-off order coupons influence spending levels and pur-

chase quantity in different, nonlinear patterns. Product-specific price discounts negatively influence customer spending at lower discount levels and positively affect spending at higher discount levels (i.e., higher than 19%), while they positively influence purchase quantity at a decreasing rate. Moreover, customers' expectations of product-specific price discounts, formed from previous discount experiences, exert a U-shaped effect on purchase incidence, spending, and purchase quantity with the effect turning positive when these expectations are higher than 31%, 27%, and 18% respectively. Therefore, we suggest that retailers should offer relatively high permanent product-specific price discounts to attract more customers to spend and purchase more. Order coupons positively influence customer spending and purchase quantity at an increasing rate. Customers' expectations of order coupons demonstrate a U-shaped pattern with a positive effect appearing on purchase incidence, spending, and purchase quantity positively influence when expectations are higher than 426 CNY, 34 CNY, and 34 CNY respectively. Nevertheless, taken into account that order coupons affect the profit margin of consumers' total order, we suggest that retailers should keep the values of permanent order coupons relatively low (we will explain this in more detail in the implication section). Besides, we show that customers' expectations of the two types of discounts moderate the effect of a current (permanent) discount on customer spending. We suggest that retailers should design their permanent discount strategy carefully to avoid negative effects; to stay competitive, they should also take customer discount expectations into account.

Literature review

As the summary in Table 1 indicates, most previous studies on discount effects discuss (1) offline discounts and (2) temporary discounts, but ignore (3) consumers' previous discount experiences and (4) other discount types beside product-specific price discounts. Findings from prior research reveal positive discount effects on purchase intentions (Grewal et al. 1998), purchase quantity (Mela, Jedidi, and Bowman 1998), and relationship duration (Thomas, Blattberg, and Fox 2004). Yet Kalwani and Yim (1992) cautioned that consumers form discount expectations after being exposed to frequent discounts and thus may start to purchase discounted products only. In their meta-analysis, DelVecchio, Henard, and Freling (2006) indicated that price discounts greater than 20% negatively influence sales in the long run, although other studies have claimed that a moderate discount depth (about 30%) is most effective (e.g., Andrews et al. 2014; Del Rio Olivares et al. 2018). Hence, prior studies also point to the importance of accounting for consumer discount expectations and for nonlinear effects of discounts on consumer purchase behavior. In the following, we will discuss prior research on discount effects in more detail.

First, the majority of existing studies focus on offline discounts, although online discounts are widely applied in practice. When online shopping was new, Reibstein (2002) identified price as the most important element for attracting customers to shopping websites, but these motivations have likely changed over time, which suggests that an online discount strategy might

induce novel effects today. A recent paper by Valentini, Neslin, and Montaguti (2020) has shown that most omnichannel customers tend to focus on one channel (i.e., online or offline) to obtain and use promotions. In addition, mobile promotions have attracted researchers' attention, because information can be delivered easily via mobile phones at very low cost and with appropriate location targeting (e.g., Fong, Fang, and Luo 2015; Hui et al. 2013). Danaher et al. (2015) considered how multiple factors influence the redemption of mobile coupons; they found that both traditional coupon features (e.g., face value, expiration length) and mobile coupon features (e.g., location and time of delivery) have significant influence. However, with the increased application of online channels in retailing, online discount strategies are emerging that we have little knowledge about. For example, a strategy of providing discounts for customers continuously can be developed in online channels because of the lower cost of offering discounts (e.g., no need for paper billboards) and the greater flexibility in adjusting discounts online compared to brick-and-mortar stores. As we noted above, given the significant features of continuous discounts (e.g., their permanence and the role played by discount expectations), existing studies of offline and online discounts do not allow us to draw conclusions as to whether or how a permanent discount strategy influences customer spending behavior. Therefore, we focus here on two specific types of permanent discounts and their distinct effects on customer purchase behavior.

Second, prior studies generally focus on discounts that exist for a specific period of time (e.g., Fang et al. 2015; see also Table 1). A permanent discount strategy differs significantly from a temporary one, because the latter evokes a sense of urgency, forcing consumers to purchase during the discount period to obtain the discount benefit (e.g., Blattberg and Neslin 1990). When they encounter permanent discounts, consumers learn to expect discounts at the next purchase occasion (or in the future more generally) and feel no compulsion to accelerate their purchases or to stockpile products. Despite the superficial resemblance, everyday low pricing (EDLP), where retailers charge stable, low prices for a range of products on a continuous basis (Hoch, Dreze, and Purk 1994), is quite different from this. EDLP is a positioning strategy (Lal and Rao 1997) associated with claims such as "guaranteed low prices" (Ortmeyer, Quelch, and Salmon 1991). Thus, it promises consumers lower average prices and reduces their need to track deals or switch to competitors. In contrast, permanent discounts are a "pure" discount strategy, without any positioning emphasis or guarantee of offering the lowest prices in the market.

Third, many studies have demonstrated that consumers form an internal reference price from their past purchase experiences (e.g., Mazumdar, Raj, and Sinha 2005). Accordingly, they perceive a gain or a loss when a current price is below or above their reference price (van Oest 2013). Lattin and Bucklin (1989), as well as Kalwani and Yim (1992), have shown that price and promotion expectations influence consumer purchases, and that ignoring these expectations leads to biased predictions of consumer decisions. Nevertheless, some recent discount studies have not taken discount expectations into account (e.g., Fang et al. 2015; Park, Park and Schweidel 2018). Moreover, as the

Table 1
Summary of Recent Discount Literature.

Paper	Research Context		Discount Type	Major Discount Variable		Channel	
	Temporary Discounts	Permanent Discounts		One or Two Types	Current Discount	Discount Expectations	Offline
Kalwani and Yim (1992)	✓		1 Brand-specific price discount	✓	✓	✓	
Gedenk and Neslin (1999)	✓		1 Brand-specific price discount	✓		✓	
Srinivasan et al. (2004)	✓		1 Brand-specific price discount	✓		✓	
Horváth and Fok (2013)	✓		1 Brand category-specific discount	✓		✓	
Jia et al. (2018)	✓		1 Product line-specific coupons	✓		✓	✓
Fong, Fang, and Luo (2015)	✓		1 Product-specific price discount	✓			✓
Fang et al. (2015)	✓		1 Product-specific price discount	✓			✓
Gong, Smith, and Telang (2015)	✓		1 Category-specific price discount	✓			✓
Breugelmans and Campo (2016)	✓		1 Category-specific price discount	✓	✓ Past promotion frequency	✓	✓
Danaher et al. (2015)	✓		1 Store-specific price discount	✓			✓
Hui et al. (2013)	✓		1 Category-specific price discount	✓			✓
Zhang and Breugelmans (2012)	✓		2 Category price discounts; reward point promotions with loyalty program	✓			✓
Park, Park, and Schweidel (2018)	✓		2 Price discount coupons; non-price free sample coupons	✓			✓
This article		✓	2 Product-specific price discount; order coupons (not specific to products)	✓	✓ Past decaying weighted average discount level		✓

inherent discontinuity of short-term discounts might not lead to expectations about subsequent discounts, studies that focus on temporary discounts will have limited generalizability.

Fourth, previous studies have mainly considered product-specific price discounts (e.g., Biswas et al. 2013), product line-specific price discounts (e.g., Jia et al. 2018), and product category-specific price discounts (e.g., Hui et al. 2013). Intuitively, since all these discounts are restricted to a specific product, a specific product line, or a specific product cate-

gory, their influence on customer spending will result mainly from spending on these particular products (for example, people stockpiling discounted products; Ailawadi et al. 2007). On the other hand, order coupons are not related to a specific product (or product line or category), and consumers may try to use an order coupon by considering combinations of multiple different products. In this case, the number of products in consumers' consideration sets when redeeming order coupons is larger than the number of products that are considered when

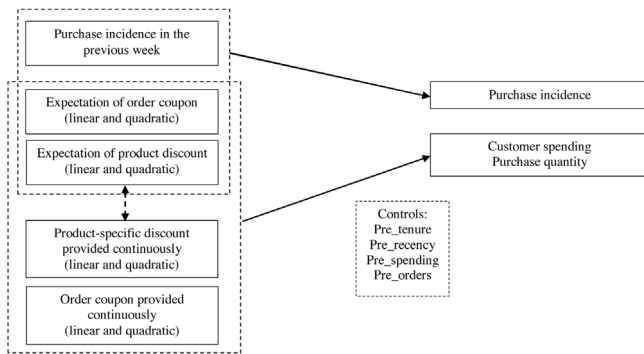


Fig. 1. Conceptual framework of the relationship between product-specific price discounts and amount-off order coupons with customer spending behavior.

Notes: The dashed line with two arrows represents interaction effects.

customers redeem product-related price discounts. Hence, order coupons may generate effects on customer spending that are different than those generated by product-related price discounts. As Levy et al. (2004) indicated, different types of discounts may have distinct effects on customer purchasing behavior. In this connection, DelVecchio, Krishnan, and Smith (2007) compared different formats of discounts (i.e., percentage off versus cents off), and they found that the discount format influences consumer perceptions of the discount price. Park, Park, and Schweidel (2018) explored the difference between two types of discounts (i.e., price discounts and free samples in mobile channels). They found that both types of discounts positively influence purchase likelihood and spending during the discount period, with free samples also having positive effects on purchase incidence after the promotion. In their comparison of price discount with the reward point promotions of a loyalty program, Zhang and Breugelmans (2012) found that consumers were more responsive to the latter. In the present paper, we will focus on the difference between order coupons and product-specific price discounts that are provided to customers permanently.

Conceptual framework

We propose the following conceptual framework to understand the effects of the two types of permanent discounts on key customer outcomes while also considering consumers' discount expectations (see Fig. 1). We assume that product-specific price discounts differ from order coupons in terms of their influence on spending and purchase quantity. We also discuss the effects of customer expectations of the two types of permanent discounts. Customer expectations of discounts are formed on the basis of previous experiences or observations; once customers have expectations, these will influence their future purchase decisions. Thus, we consider the influence of customer expectations of the two types of permanent discounts on purchase incidence and actual purchase behavior (i.e., spending and purchase quantity). Moreover, as customers' discount expectations may influence their responses to current discounts, we explore whether discount expectations interact with currently provided discounts. Overall, within our conceptual framework, we analyze the effects of two types of discounts on consumers'

purchase quantity and spending and their interactions with discount expectations, while discount expectations influence both purchase incidence and actual purchase behavior (i.e., spending and purchase quantity).¹

Effects of permanent product-specific price discounts on purchase behavior

Price discounts offer an effective way for consumers to obtain economic savings, so shoppers tend to increase their spending in response to discounts (e.g., Kendrick 1998). Although Raghuram (1998) suggested that consumers might perceive higher product prices in response to a higher discount, other studies have argued that consumers derive further benefits in addition to savings from discounts, such as opportunities to buy higher-quality products, a better shopping experience, and means for value expression, entertainment, and exploration (e.g., Chandon, Wansink, and Laurent 2000). Discounts also may increase customers' mental budgets and encourage them to purchase more (Jia et al. 2018). In addition, studies have shown that discounts have purchase reinforcement effects (Kahn and Raju 1991) and that they increase state dependence over time (Keane 1997). In the context of the intense competition in today's market, in a recent global industry study 57% of firms reported being involved in a price war (Simon-Kucher and Partners 2020). In this environment, consumers may experience a variety of discounts from which they can derive more benefits.

Nevertheless, when a retailer offers price discounts for specific products continuously (i.e., permanent product-specific price discounts), consumers may recognize that these products are always discounted and thus may not feel the need to accelerate their future purchases in response (Blattberg and Neslin 1990). Moreover, consumers might make negative inferences when discount levels increase. For example, Della Bitta, Monroe, and McGinnis (1981) argued that a drastic price reduction might be perceived as exaggerated or fake. Jensen and Drozdenko (2004) found that consumers' perceptions of product quality did not change at discount levels below 30%. Nevertheless, if a discount exceeds 40%, customers' value perceptions and purchase intentions are undermined. In their meta-analysis, DelVecchio, Henard, and Freling (2006) noted that discounts greater than 20% negatively influence customer preferences for a promoted brand. Andrews et al. (2014) recommended a 30% discount as most effective for increasing customer purchases, relative to no discount or a 50% discount. Similarly, Del Rio Olivares et al. (2018) reported that discounts between 5% and 35% have positive effects on customer retention, whereas levels below 5% and above 35% exert a negative influence. In their empirical study, Jia et al. (2018) confirmed an inverted U-shaped

¹ Note that we observe particular product-specific price discounts and order coupons only when they are redeemed by a customer in a given week; this is why we cannot explore their effects on purchase incidence. Given that we observe all the discounts that a customer has experienced prior to a given week, we are able to analyze the effects of consumers' discount expectations on their current purchase likelihood in a given week.

effect of product line-specific discount depth on customer spending.

Taking these considerations together, we thus expect permanent discounts to strengthen consumers' perceived benefits but also their sensitivity to prices and discounts (Mela, Gupta, and Lehmann 1997). We therefore argue, against previous studies, that the negative effect of higher price discounts mentioned above does not necessarily lead to negative purchase behavior. Instead, we expect that it will weaken the positive effect of higher discounts on purchasing.

H1. Purchase quantity for a placed order will increase with an increase of the value of a product-specific price discount, though at a decreasing rate.

The effect of product-specific price discounts on customers' spending is relatively unclear. How and to what extent customer spending will be affected will depend on the comparison between the change of purchase quantity and the change of price due to discounts. It is hard to derive which part (i.e., the change of quantity or price) overwhelms another from theories. Therefore, we do not state a specific hypothesis for the effect of product-specific price discounts on spending but will of course explore this effect in our subsequent analyses.

Effects of permanent order coupons on purchase behavior

Intuitively, negative inferences caused by high discounts (e.g., lower reputation or poor quality) can occur in the case of order coupons. However, consumers may derive more benefits from order coupons than from product-specific price discounts. The major difference between product-specific price discounts and order coupons is that the former relate entirely to a particular product, whereas the latter do not. Therefore, if consumers mentally allocate the value of a coupon to each product in a basket, they may perceive that the prices of all the products in the basket are reduced; in contrast, a product-specific price discount reduces the price for one product only. Moreover, some order coupons are conditional, such as "Spend 300 CNY and get a 30 CNY coupon." In such cases, consumers may search for and purchase multiple products to achieve the amount required to redeem the coupon (Lee and Ariely 2006). Order coupons of this sort may therefore stimulate customer purchase quantity and spending more strongly than product-specific price discounts.

We assume that the benefits associated with product-specific price discounts (e.g., savings, greater budgets, and opportunities to buy higher-quality products) also apply to order coupons, with coupons also having a positive effect on customers' purchase quantity for a given order. Moreover, this positive effect will increase with higher coupon levels. Thus, our second hypothesis is as follows:

H2. Purchase quantity for a placed order will increase with an increase of the value of an order coupon at an increasing rate.

Similarly, it is difficult to theorize the influence of order coupons on customer spending, which should rely on the comparison between the change in purchase quantity due to the coupons and the change in spending due to the reduction effect

of the coupons (i.e., the higher the value of the coupons, the less money consumers need to pay). Hence, we will explore this effect in the context of our empirical analyses.

Effects of customers' discount expectations

When consumers observe that a retailer provides price discounts and/or order coupons continuously, these permanent discounts may signal a poor retailer image (e.g., low product or service quality, low reputation, or poor management), with the result that knowledgeable consumers start to question the retailer's strategic motivations (e.g., Biswas et al. 2013). This can undermine consumer purchase likelihood (e.g., Dodson, Tybout, and Sternthal 1978). In addition, consumers evaluate current offers and make purchase decisions on the basis of comparisons between the observed offer and their internal reference price points (Kalyanaram and Winer 1995). They learn from experience how to form price and discount expectations. Such expectations are particularly relevant for permanent discounts. When discounts are provided continuously, consumers expect that they will be provided in the future, too. Once consumers start to expect them as a rule rather than an exception, discounts may no longer be able to incentivize customer spending (Lattin and Bucklin 1989).

Moreover, Breugelmans and Campo (2016) affirmed that the frequency of price discounts in digital channels reduces the effectiveness of future discounts. Even temporary price discounts reduce consumers' price expectations, which may reduce purchase intentions for products sold at regular prices (DelVecchio, Krishnan, and Smith 2007). In a permanent discount context, consumers' reference price or their price expectations will likely equal the discounted price that they observed or experienced previously. We therefore expect that higher discount expectations will negatively influence customers' purchase incidence and actual purchase behavior. Thus, we propose hypotheses as follows:

H3. Customers' expectations of product-specific price discounts negatively influence (a) purchase incidence, (b) purchase quantity, and (c) total spending.

H4. Customers' expectations of order coupons negatively influence (a) purchase incidence, (b) purchase quantity, and (c) total spending.

Higher discount expectations may also cause customers to perceive smaller gains from later discounts (Kalwani and Yim 1992), if they feel disappointed by smaller discounts. For example, if a customer previously received a 30% price discount on average, a current 20% discount will not seem like a good deal. Therefore, we expect that consumer discount expectations moderate the effects of current discounts. Thus, we propose the following hypotheses:

H5. Customers' expectations of product-specific price discounts weaken the current effects of product-specific price discounts on purchase quantity.

Table 2
Operationalization of Variables.

Subscripts		
<i>i</i>	The <i>i</i> th customer	
<i>t</i>	The <i>t</i> th week	
Variables	Computed Period	Description and Calculation
Dependent variables		
PI_{it}	Analysis period	Purchase incidence = 1 if a customer purchases in a given week, 0 otherwise
S_{it}	Analysis period	Average ordering spending = $\ln(\text{Average spending in each order in a given week} + 1)$
Q_{it}	Analysis period	Average order quantity = $\ln(\text{Average number of items in each order in a given week} + 1)$
Explanatory variables		
PI_{it-1}	Analysis period	Lagged term of PI_{it} to capture state dependence
$Ave.PD_t$	Analysis period	Average product-specific discount in the <i>t</i> th week provided by the retailer = $\ln(\text{Average product-specific discount based on product discounts obtained by all customers who have purchases in } t\text{th week} + 1)$
$Ave.OD_t$	Analysis period	Average coupon value in the <i>t</i> th week provided by the retailer = $\ln(\text{Average coupon value based on coupons obtained by all customers who have purchases in } t\text{th week} + 1)$
PD_{it}	Analysis period	= $\ln(\text{Average product-specific price discount ratio in each order experienced by customer } i \text{ in week } t)$; product-specific price discount ratio = discounted amount per item of a specific product / this product's regular price
$PDexp_{it}$	Analysis period	Product-specific discount expectation = $\ln(\text{Decaying weighted average of product-specific discount ratios obtained in previous periods} + 1)$. The value of the first period is the average of PD for the initialization period.
OD_{it}	Analysis period	= $\ln(\text{Average total coupon value in each order per week} + 1)$
$ODexp_{it}$	Analysis period	Order coupon expectation = $\ln(\text{Decaying weighted average coupon value obtained in previous periods} + 1)$
Controls		
$Tenure_i$	Initialization period	= $\ln(\text{Number of days between a customer's first order to June 30, 2015} + 1)$
$Recency_i$	Initialization period	= $\ln(\text{Number of days between a customer's last order to June 30, 2015} + 1)$
$Pre_spending_i$	Initialization period	= $\ln(\text{Total spending} + 1)$
Pre_orders_i	Initialization period	= $\ln(\text{Number of total orders} + 1)$

H6. Customers' expectations of order coupons weaken the current effects of order coupons on purchase quantity.

Given that we do not propose clear expectations for the influence of the two types of current discount levels on customer spending, we cannot build hypotheses for the interaction effects between discounts and discount expectations on spending either, which we will explore in later empirical analyses.

Data

Description of data

To answer our research questions, we worked with a small-to-medium-sized Chinese retailer that offers permanent discounts for almost all of its products.² When the focal retailer was first established in 2011, its traditional brick-and-mortar shops pre-

² To gather preliminary insights into the prevalence of permanent discounts, we collected data about the pricing strategies of 22 small and medium-sized Chinese digital retailers from their websites in February 2019, including our focal firm. Of these 22 retailers, 13 provide permanent discounts for their complete assortment or part thereof, and nine offer temporary promotions (e.g., daily deal offers). Of the thirteen retailers offering permanent discounts, five offer them for all categories but do not claim to be discount stores. We also observe that their close competitors (i.e., retailers offering similar products with very similar prices) use similar strategies, signaling that a permanent discount strategy is

dominately sold baby products, but over time it added a wide range of other product categories to its assortment (e.g., cosmetics, snacks). After introducing an online store in 2012, it shifted most of its sales focus (i.e., 95%) from offline to online, and in 2014 it launched mobile sales channels to expand its multi-channel mix. The product assortment, prices, and discounts are the same across all channels, and the retailer provides two types of discounts: product-specific price discounts (PD) in the form of discounted prices for products, and order coupons (OD) in the form of amount-off coupons (e.g., 10 CNY off).^{3,4} In our dataset, we identify 5686 different products, only 253 (4.45%) of which are offered without a price discount. On each product page, the retailer presents the regular and discount prices

applied by small and medium-sized digital retailers to remain competitive and to attract customers away from their peer competitors.

³ In Western countries, coupons are often presented in form of “% off,” “\$ off,” and “Buy one, get one free” (Raghubir 2004; Drechsler et al. 2017); for example, when you sign in on a retailer's website for the first time, you can get an X% coupon. In China, order coupons are normally formatted as amount-off discounts.

⁴ The focal retailer offers both unconditional coupons (e.g., a 10 CNY-off coupon, which can be redeemed for any orders) and conditional coupons (e.g., a 10 CNY-off coupon, which can be only redeemed for orders with a certain amount). Unfortunately, our data does not allow us to differentiate the two types of order coupons. But from a senior manager we know that unconditional coupons accounts for more than 90% of all order coupons while conditional coupons are no more than 10%.

Table 3
Descriptive Analysis of Major Variables.

	Min	Median	Mean	Max	SD	SE
PI _{it}	0.00	0.00	0.20	1.00	0.40	0.00
S _{it}	2.28	2.64	2.86	5.39	0.47	0.00
Q _{it}	0.69	0.69	0.86	2.71	0.27	0.00
Ave.PD _t	0.12	0.21	0.21	0.26	0.03	0.00
Ave.OD _t	3.67	3.89	3.95	4.32	0.20	0.00
PD _{it}	0.00	0.20	0.21	0.47	0.09	0.00
PDexp _{it}	0.00	0.24	0.27	0.83	0.12	0.00
OD _{it}	1.39	3.81	3.73	5.70	0.75	0.01
ODexp _{it}	0.00	3.68	3.54	6.95	0.78	0.00
Tenure _i	0.00	4.78	4.78	5.20	0.54	0.01
Recency _i	0.00	4.76	4.64	5.19	0.68	0.01
Pre._spending _i	2.39	3.28	3.50	8.86	1.12	0.02
Pre._orders _i	0.69	0.69	0.91	2.56	0.34	0.01

for more than 95% of its products. Only 104 (2.69%) of customers in our data set have a purchase history without any price discounts. The retailer also sends coupons to customers which can be redeemed against any order. Some of these coupons are the same across customers, but others are based on customers' current and previous spending behavior.

We obtained data for the online and mobile channels of our focal retailer for the period January 1 to December 31, 2015. These data include customer order information: order time, online versus mobile channel, products in each order, regular prices, price-specific discounts, coupons redeemed in each order, number of items, and actual spending in Chinese yuan (CNY). To retain more granular data information, we aggregated the data to weekly panels instead of monthly panels. To capture customers' prior purchase behavior (tenure, recency, frequency, and spending), we split the data into an initialization period from January 1 to June 31, 2015 and an analysis period from July 1 to December 31, 2015. We identified 3866 unique customers who ordered at least once in the initialization period and at least once in the analysis period. In the analysis period, customers entered a total of 32,470 orders.

Operationalization of variables

In the following, we detail the operationalizations of our focal variables from our conceptual framework (see Table 2). We provide descriptive analyses in Table 3.

Dependent variables

We take both purchase incidence (labeled PI_{it}) and actual purchase behavior by customers exposed to the focal retailer's discounts as dependent variables (e.g., Breugelmans and Campo 2016; Jia et al. 2018). In terms of actual purchase behavior, we measure spending level and quantity of each order on average for each week (labeled S_{it} and Q_{it}, respectively).

Explanatory variables

The retailer offers relatively high discounts, especially with its order coupons. The weekly average product-specific price discount ratio for each order, i.e., the average weekly ratio of

discounts to regular prices of all products purchased by all customers, is 24%; the weekly average order coupon value is 40.68 CNY, or 64% of an average order in terms of spending.⁵ The ratio of the total discount amount (product-specific price discounts plus order coupons) to each order's total spend at regular prices is 85.60% per customer on average. The descriptive information for the logarithm values of the two variables PD_{it} (price discount ratio) and OD_{it} (absolute value of coupons) are in Table 3.⁶ We also include consumers' expectations of PD_{it} and OD_{it} as explanatory variables (i.e., PDexp_{it} and ODexp_{it}, respectively), which we specify as the decaying weighted average levels of PD_{it} and OD_{it} that a consumer had redeemed previously.⁷

Control variables

We use customers' purchase-related behavior in the initialization period to control for customer heterogeneity. Specifically, we include tenure, recency, total spend, and number of orders in our model.

Methodology

Endogeneity of discount variables

Retailers generally use discounts strategically, so discounts may be endogenous (Bijmolt, van Heerde, and Pieters 2005). We use a copula approach to correct for potential endogeneity due to the correlation between the discount variables and error terms. Park and Gupta (2012) proposed Gaussian copulas to account for endogeneity issues, with the addition of integrating the copula terms of all endogenous variables in the major models as additional regressors. This approach is widely used in marketing research (e.g., Datta, Ailawadi, and van Heerde 2017). To address the lack of availability of good instruments for endogenous variables, a copula approach provides an effective solution without requiring exclusion restrictions.

In our study, we encounter six potential endogenous variables (i.e., the main discount variables and their interactions), which makes it extremely difficult to find appropriate instruments. Thus, we apply a copula approach to obtain

$$p^* = \Phi^{-1}(H(p))$$

⁵ These percentages are calculated from the original data, without taking logarithms.

⁶ The logarithm was taken to reduce data skewness and to reduce the variable range of data.

⁷ The decaying weighted average calculation was employed to account for memory decay or consumers forgetting what they experienced before. For the sake of simplicity, we assume that consumer memory decay follows a linear pattern. Thus, we assume and assign a linear increasing sequence with a starting point of 1, and the interval is 1 (i.e., 1, 2, 3, 4, ..., 28) for the first week to the last week in our time window, which can be proxied as the value of freshness of one's memory in week *t*. The higher the value, the fresher the memory is. We then use the percentage of sequence value as the weight to each week's discounts experienced by individuals to calculate average discounts as their discount expectations. Specifically, we calculate the weights for a customer *i*'s discount expectations in a current period *T* with the following formula: weight_{it} = sequence value_{it} / (sequence value_{i,t-1} + sequence value_{i,t-2} + ... + sequence value_{i,t} + sequence value_{i,t+1} + ... + sequence value_{i,T-1}), where *t* < *T*.

where $H(p)$ is the empirical cumulative density function (CDF) of an endogenous regressor p , and Φ^{-1} is the inverse normal CDF. A Gaussian copula approach requires that the potentially endogenous variables are not normally distributed, so we apply the Anderson–Darling normality test to confirm that the endogenous variables do not exhibit normal distributions. We also apply the Shapiro–Wilk test to a randomly selected sample of 5000 records to ensure consistent non-normal distributions.

In addition to the potential endogeneity of specific discounts, specific customers may receive more discounts because of the firm’s targeting policy. We apply a Mundlak approach to correct for potential endogeneity in discounts due to individual differences (Mundlak 1978; Risselada, Verhoef, and Bijmolt 2014). This approach constructs average product-specific price discount ratios and average total coupon values for each order per week and customer in the analysis period, as two additional explanatory variables. These variables account for how customers differ in their possibility of receiving discounts (labeled $Mund.PD_i$ and $Mund.OD_i$, respectively).

Model specification

As customers’ spending and purchase quantity are conditional on their decisions on whether to buy in a given week, we first specify customer purchase likelihood. We use a binary purchase incidence variable that indicates whether a customer purchases in week t . We cannot observe discounts without any purchase in a given week t ; we observe only discounts that the customer redeemed in previous weeks. Thus, to explain a customer’s purchase likelihood in week t , we include the decaying weighted average level of discounts obtained before week t as a proxy for a customer’s discount expectations, and we control for potential nonlinear relationships. We also include the average discount level for a given week, based on discounts obtained by all customers who made purchases in the t th week ($Ave.PD_t$ and $Ave.OD_t$), as proxies of the current discount levels in week t provided by the retailer. Using customers’ purchase incidence in the previous week, we capture state dependence between the two consecutive time periods. The Mundlak terms correct for potential individual endogeneity bias.

We propose that PI_{it} , which indicates whether customer i makes a purchase in week t , is driven by the latent utility (PI_{it}^*) of customer i for purchasing in a given week t , such that

$$PI_{it} = \begin{cases} 1 & \text{if } PI_{it}^* > 0 \\ 0 & \text{unobserved if } PI_{it}^* \leq 0. \end{cases} \tag{1}$$

The latent utility is specified as follows:⁸

$$PI_{it}^* = PI_{it-1} + PDexp_{it} + PDexp_{it}^2 + ODexp_{it} + ODexp_{it}^2 + Ave.PD_t + Ave.OD_t + Mund.PD_i + Mund.OD_i$$

⁸ To control for general time trends and holiday effects, we estimate each week’s contribution instead of linear time trend effects. To save space and keep the equation relatively simple, we omit coefficients (β) for all explanatory variables in all equations.

$$+Tenure_i + Recency_i + Pre_spending_i + Pre_orders_i + A \text{ set of week indicators} + \xi_{1i} + \varepsilon_{1it} \tag{2}$$

We then model customers’ actual purchase behavior, i.e., their average spending for each order in a given week and the average quantity for a given order. Spending (S_{it} , reflecting average order spending) and quantity (Q_{it} , reflecting the average number of items in an order as purchase quantity) are conditional on observing a purchase in week t by customer i . As previously discussed, customers’ discounts redeemed in a current week and discount expectations formed from previous discounts influence purchasing behavior. The quadratic terms of these discount-related variables enable us to test for potential nonlinear relationships. To account for the hypothesized moderating effect of discount expectations, we include interaction effects between discounts and discount expectations. Finally, we again add copula (Papies, Ebbes, and van Heerde 2017) and Mundlak terms to correct for the potential endogeneity of discounts as well as other controls, as in Eq. (2). The equations for order spending and quantity are as follows:

$$S_{it} = \begin{cases} S_{it}^* & \text{if } PI_{it}^* > 0 \\ 0 & \text{unobserved if } PI_{it}^* \leq 0 \end{cases} \tag{3}$$

$$S_{it}^* = PD_{it} + PD_{it}^2 + PD_{it} * PDexp_{it} + OD_{it} + OD_{it}^2 + OD_{it} * ODexp_{it} + PDexp_{it} + PDexp_{it}^2 + ODexp_{it} + ODexp_{it}^2 + Mund.PD_i + Mund.OD_i + A \text{ set of copula terms} + Tenure_i + Recency_i + Pre_spending_i + Pre_orders_i + A \text{ set of week indicators} + \xi_{2i} + \varepsilon_{2it} \tag{4}$$

$$Q_{it} = \begin{cases} Q_{it}^* & \text{if } PI_{it}^* > 0 \\ 0 & \text{unobserved if } PI_{it}^* \leq 0 \end{cases} \tag{5}$$

$$Q_{it}^* = PD_{it} + PD_{it}^2 + PD_{it} * PDexp_{it} + OD_{it} + OD_{it}^2 + OD_{it} * ODexp_{it} + PDexp_{it} + PDexp_{it}^2 + ODexp_{it} + ODexp_{it}^2 + Mund.PD_i + Mund.OD_i + A \text{ set of copula terms} + Tenure_i + Recency_i + Pre_spending_i + Pre_orders_i + A \text{ set of week indicators} + \xi_{3i} + \varepsilon_{3it} \tag{6}$$

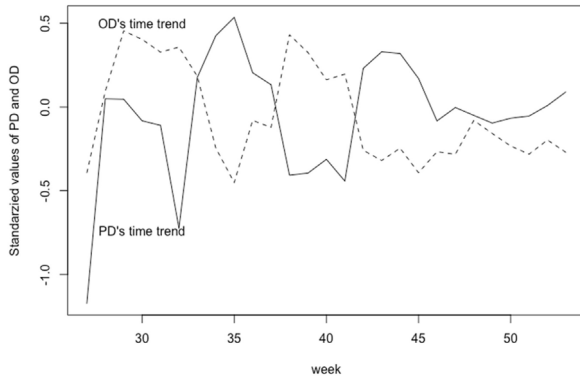


Fig. 2. Time trends of product price discounts (PD) and order coupons (OD).

Eqs. (1) and (2) together constitute a mixed-effects probit incidence model; Eqs. (3)–(6) are mixed-effects panel regression models. ξ_i represents customer random effects that capture unobservable individual differences. ε_{it} is the residual for customer i in week t . The error structures are as follows, where the means $-\mu_{re}$ and μ_e are 3×1 vectors and set to 0: $[\xi_{1i} \xi_{2i} \xi_{3i}] (\sim MVN(\mu_{re}, \Sigma_{re}))$, and $[\varepsilon_{1i} \varepsilon_{2i} \varepsilon_{3i}] (\sim MVN(\mu_e, \Sigma_e))$.

To check whether customers who purchase in a given week inherently spend more ($\sigma_{12re}^2 > 0$) or less ($\sigma_{12re}^2 < 0$) than those who do not purchase in that week, we allow random effects and errors to correlate across equations. The correlation of errors of the three equations in Σ_e indicates the potential selection bias that could result if the same unobserved factors cause different dependent variables to change in specific directions at the same time. The variance of the purchase incidence equation is set to 1 for identification of the equation system. Thus, the covariance matrices Σ_{re} and Σ_e can be presented as follows:

$$\Sigma_{re} = \begin{bmatrix} \sigma_{1re}^2 & \sigma_{12re}^2 & \sigma_{13re}^2 \\ \sigma_{12re}^2 & \sigma_{2re}^2 & \sigma_{23re}^2 \\ \sigma_{13re}^2 & \sigma_{23re}^2 & \sigma_{3re}^2 \end{bmatrix}$$

$$\Sigma_e = \begin{bmatrix} 1 & \rho_{12e}^2 & \rho_{13e}^2 \\ \rho_{12e}^2 & \rho_{2e}^2 & \rho_{23e}^2 \\ \rho_{13e}^2 & \rho_{23e}^2 & \rho_{3e}^2 \end{bmatrix}$$

Results and discussion

Since one of our aims were to compare the influence of product-specific price discounts (PD_{it}) with the influence of order coupons (OD_{it}) on customer behavior, we standardized all continuous explanatory variables. Table 4 presents the correlation matrix of PD-related variables and OD-related variables. All the relatively high correlations (higher than 0.50) appear between PD-related variables and OD-related variables rather than within PD- or OD-related variables, e.g., the correlation between PD_{it} and OD_{it} is -0.78 . We know from the retailer that part of its strategy is to treat product-specific price discounts and order coupons as substitutive marketing instruments, which is supported by our data (see Fig. 2). The retailer tends to

Table 4
Correlation Matrix (Product-specific Price Discount-related Variables and Coupon-related Variables).

	PD_{it}	PD_{it}^2	$PD_{it} * PD_{exp_{it}}$	Ave. PD_t	Mund. PD_{it}	$PD_{exp_{it}}$	$PD_{exp_{it}}^2$	OD_{it}	OD_{it}^2	$OD_{it} * OD_{exp_{it}}$	Ave. OD_t	Mund. OD_{it}	$OD_{exp_{it}}$	$OD_{exp_{it}}^2$
PD_{it}	1.000													
PD_{it}^2	0.280	1.000												
$PD_{it} * PD_{exp_{it}}$	-0.176	0.031	1.000											
Ave. PD_t	0.080	0.067	-0.025	1.000										
Mund. PD_{it}	0.150	0.041	0.031	0.000	1.000									
$PD_{exp_{it}}$	0.028	-0.044	-0.016	-0.145	0.340	1.000								
$PD_{exp_{it}}^2$	-0.007	-0.018	0.018	-0.107	-0.116	0.586	1.000							
OD_{it}	-0.779***	-0.294	0.161	-0.059	-0.116	0.015	0.022	1.000						
OD_{it}^2	0.335	0.813***	-0.057	0.066	0.048	-0.042	-0.025	-0.236	1.000					
$OD_{it} * OD_{exp_{it}}$	-0.047	0.067	0.543***	-0.010	0.039	-0.038	-0.047	0.090	0.080	1.000				
Ave. OD_t	-0.053	0.005	0.025	-0.305	0.000	0.159	0.087	0.131	0.020	0.004	1.000			
Mund. OD_{it}	-0.105	-0.012	-0.028	0.000	-0.698***	0.340	-0.107	0.151	0.009	-0.044	0.000	1.000		
$OD_{exp_{it}}$	-0.031	0.015	0.004	0.092	-0.322	-0.779***	-0.507	0.031	0.022	0.058	-0.053	0.496	1.000	
$OD_{exp_{it}}^2$	-0.002	-0.029	0.010	-0.093	-0.034	0.532	0.796***	0.027	-0.031	-0.026	0.104	0.002	-0.428	1.000

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 5
Simultaneous Estimation of Purchase Incidence, Spending, and Purchase Quantity.

Estimating Product-Specific Price Discount Effects				Estimating Order Coupon Effects			
	PI _{it}	S _{it}	Q _{it}		PI _{it}	S _{it}	Q _{it}
Constant	−0.510*** (0.099)	3.405*** (0.094)	1.055*** (0.044)	Constant	−0.310** (0.114)	2.610*** (0.061)	0.663*** (0.033)
PI _{it-1}	0.374*** (0.012)			PI _{it-1}	0.736*** (0.018)		
Ave.PD _t	0.694*** (0.036)	−0.553*** (0.076)	−0.243*** (0.018)	Ave.PD _t	0.813*** (0.036)	−0.072 (0.061)	0.016 (0.014)
Ave.OD _t	1.156*** (0.126)	−1.158*** (0.129)	0.570** (0.058)	Ave.OD _t	1.475*** (0.146)	−0.253** (0.084)	−0.135** (0.041)
PDexp _{it}	−0.023 (0.012)	0.051*** (0.011)	0.032** (0.006)	ODexp _{it}	−0.071*** (0.011)	0.008 (0.005)	0.001 (0.003)
PDexp _{it} ²	0.028*** (0.006)	0.110*** (0.005)	0.018** (0.003)	ODexp _{it} ²	0.011* (0.006)	0.009*** (0.002)	0.004** (0.001)
PD _{it}		0.051** (0.015)	0.035*** (0.008)	OD _{it}		0.741*** (0.074)	0.300*** (0.047)
PD _{it} ²		0.062*** (0.007)	−0.004** (0.003)	OD _{it} ²		0.081*** (0.006)	0.041*** (0.004)
PD _{it} *PDexp _{it}		0.033*** (0.006)	0.007 (0.003)	OD _{it} *ODexp _{it}		0.010** (0.003)	0.002 (0.002)
Mund.PD _i	0.034** (0.012)	−0.083*** (0.013)	−0.037*** (0.006)	Mund.OD _i	0.047*** (0.011)	0.027*** (0.006)	0.017*** (0.003)
Copula(PD _{it})		−0.118*** (0.014)	−0.022** (0.007)	Copula(OD _{it})		−0.508*** (0.073)	−0.179*** (0.046)
Copula(PD _{it} ²)		−0.064*** (0.008)	−0.034*** (0.004)	Copula(OD _{it} ²)		0.041*** (0.005)	0.018*** (0.003)
Tenure _i	0.071 (0.043)	−0.018 (0.034)	−0.003 (0.015)	Tenure _i	0.095* (0.038)	0.014 (0.012)	0.015* (0.006)
Recency _i	−0.112** (0.037)	0.039 (0.027)	0.018 (0.012)	Recency _i	−0.138*** (0.029)	−0.020* (0.008)	−0.007 (0.005)
Pre_spending _i	−0.028 (0.016)	0.047** (0.014)	0.018** (0.006)	Pre_spending _i	−0.007 (0.018)	0.009 (0.005)	−0.002 (0.003)
Pre_orders _i	0.771*** (0.049)	−0.478*** (0.037)	−0.218*** (0.018)	Pre_orders _i	0.846*** (0.050)	0.071** (0.020)	0.046** (0.014)
Log-Likelihood	−43559.80			Log-Likelihood	−36778.31		
AIC	87365.60			AIC	73804.63		
BIC	88540.97			BIC	74989.55		

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: The robust standard errors are given in parentheses; the continuous independent variables are standardized. We conducted several robustness checks, using models that (1) control for time trends without differentiating each week’s contribution, (2) do not control for average levels of price discount and coupon value, (3) do not allow individual effects to be correlated across equations, and (4) do not allow error terms to be correlated across equations. All these models provided similar findings to the results reported in this table. We also examined whether consumers’ channel preferences (PC vs. mobile) play a moderating role. Of the 3866 customers in our data set, 288 used only mobile channels to purchase in the first six months of our observation period, 3329 customers used only PCs, and 249 customers used both channels. Thus, the average mobile ratio is low (.083). We added mobile ratio to our main models and re-estimated the impacts of the two types of discounts on the outcome variables, correcting the self-selection bias, but did not find any significant main effects of channel preference or its interactions. Recognizing that non-significant effects of channel preference might be caused by a skewed distribution of the mobile ratio, we replaced the continuous mobile ratio with a dummy variable that captures whether a customer prefers mobile or online channels (mobile ratio $\geq .5$, dummy = 1, otherwise = 0) and then re-estimated the models. Again, the interaction effects of channel preference were not significant. The effects of the two types of discounts on purchasing behavior remained consistent with our main estimation. The detailed results are available on request.

provide lower order coupons when it is already offering higher product-specific price discounts, and vice versa, to avoid consumers experiencing two types of discounts at the same time (which may lead to severe revenue losses for the retailer).

To avoid multicollinearity issues, we modeled the effects of PD-related variables and OD-related variables on purchasing behavior separately in different regressions. When modeling the effects of PD-related variables, we controlled for the average value of order coupons redeemed by all customers in a given week (Ave.OD_t) as a proxy of the general order coupon value level provided by the retailer in that week. Similarly, when modeling the effects of OD-related variables on purchasing behavior, we controlled for the average product-specific price discount level in a week (Ave.PD_t). We detail the results from the simultaneous estimation of Eqs. (1)–(6) in Table 5.

Nonlinear effects of product-specific price discounts

We first present the findings for PD_{it} from the spending and quantity equations. PD_{it} and its quadratic terms are significant in both equations. In the spending equation, the effect of PD_{it} follows a U-shaped curve ($\beta_{PD} = .051$, $p < .01$; $\beta_{PD^2} = 0.062$, $p < .001$), whereas the effect of PD_{it} on purchase quantity follows an inverted U-shaped curve ($\beta_{PD} = 0.035$, $p < .001$; $\beta_{PD^2} = -.004$, $p < .01$). Since PD_{it} is standardized in the estimation,

PD_{it} varies between −2.40 and 2.90. In this range, the effect of PD_{it} on spending indeed follows a U-shaped pattern (Fig. 3a), but its effect on purchase quantity is positive at a decreasing rate (Fig. 3c). These results indicate that, with an increase in product-specific price discount levels, customers’ spending first decreases and then increases, while their purchase quantity first increases with a relatively steep slope but then levels off. Hypothesis H1 is therefore supported.

The original product-specific price discount level corresponding to the vertex of the U-shaped effect in the spending equation is 18.89% ($=\exp(-0.411*0.09 + 0.21) - 1$) after de-standardization and anti-logarithm, meaning that discounts higher than 18.89% positively influence spending, whereas discounts lower than 18.89% have a negative effect on spending. As already indicated in our conceptual framework, the change of spending caused by discounts should rely on the tradeoff between the change of purchase quantity and monetary reduction due to discounts. The explanation for the U-shaped pattern may be that the increased spending resulting from the larger purchase quantity attracted by discounts lower than 18.89% does not offset the reduction in spend due to the discounts (Raghubir 2004); discounts higher than 18.89% encourage customers to purchase more items and generate higher spending, which compensates for the spending reduction that results from offering these discounts.

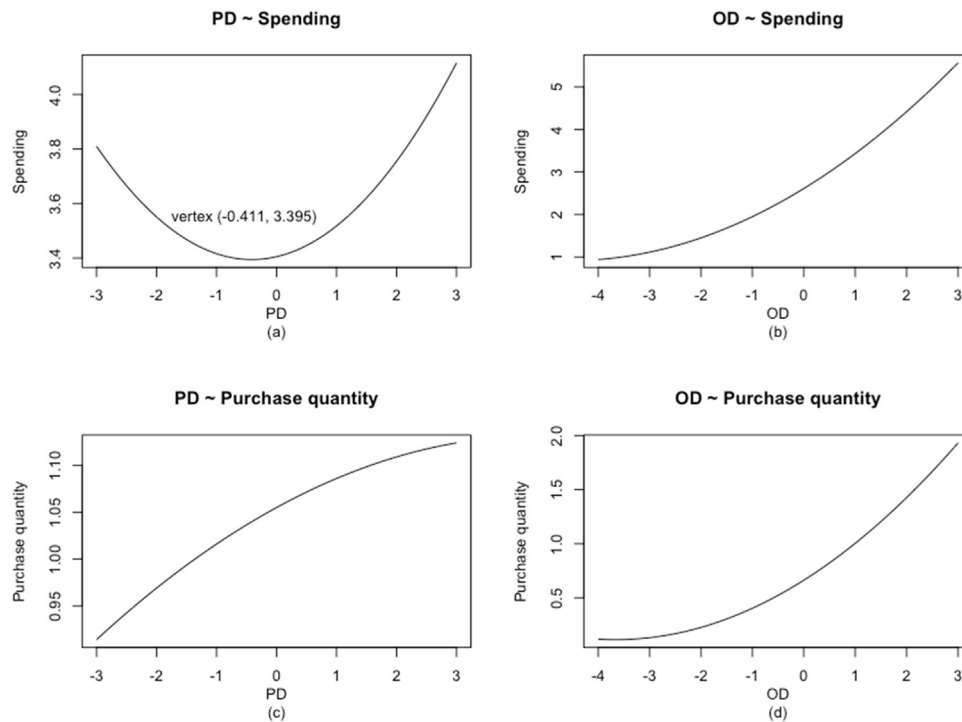


Fig. 3. Effects of price discounts (PD) and order coupons (OD) on spending and purchase quantity. Note: Both PD and OD are standardized values.

Nonlinear effects of order coupons

OD_{it} and its quadratic terms are significant in the spending and quantity equations as well (spending: $\beta_{OD} = 0.741, p < .001$; $\beta_{OD}^2 = 0.081, p < .001$; quantity: $\beta_{OD} = 0.300, p < .001$; $\beta_{OD}^2 = 0.041, p < .001$). The standardized OD_{it} ranges from -3.11 to 2.62. Within this range, the effects of OD_{it} on spending and purchase quantity are increasingly positive (see Fig. 3b and d), supporting hypothesis H2.

The amount-off order coupons, which can be redeemed for the whole order and are not restricted to a specific product, influence customer purchase behavior differently than product-specific price discounts. As we expected, order coupon value influences customers' purchase quantity positively, and the higher the coupon value, the stronger the positive effect on purchase quantity. Moreover, our results show that the coupon value positively influences customer spending in a similar way as for purchase quantity. Two explanations are possible: (1) The stimulated spending from purchasing more items due to coupons exceeds the coupon value that is deducted from the customer payment; (2) Higher coupon values encourage consumers to buy more expensive products that would normally be unaffordable. To test the second explanation, we conducted additional analysis and found that order coupon value has a significant positive effect ($\beta = 0.305, p < .001$) on the average price of products purchased by customers in a given week.⁹ Both of these cases may lead consumers to spend more due to a higher coupon value.

⁹ We conducted an additional regression to model the effect of order coupons on the average prices of products purchased by each customer in a given week. The full estimation results are available on request.

Effects of discount expectations

Direct effects

Customer expectation of product-specific price discounts (PD_{exp_{it}}) exerts similar effects on purchase incidence, spending, and quantity. Specifically, its influence on each of the three dependent variables is a U-shaped relationship (incidence: $\beta_{PDexp} = 0.027, p < .05$; $\beta_{PDexp}^2 = 0.028, p < .001$, Fig. 4a; spending: $\beta_{PDexp} = 0.051, p < .001$; $\beta_{PDexp}^2 = 0.110, p < .05$, Fig. 4c; quantity: $\beta_{PDexp} = 0.032, p < .01$; $\beta_{PDexp}^2 = 0.018, p < .01$, Fig. 4e). Likewise, customers' expectations of order coupons (OD_{exp_{it}}) influence the three outcome variables in a U-shaped way (see Fig. 4b, d, and f), as the quadratic terms are significant and positive in the three equations (incidence: $\beta_{ODexp} = -.071, p < .001$; $\beta_{ODexp}^2 = 0.011, p < .05$; spending: $\beta_{ODexp}^2 = 0.009, p < .001$; quantity: $\beta_{ODexp}^2 = 0.004, p < .01$).

Hypothesis H3 expects that customers' product price discount expectations will negatively influence the three purchase outcomes. Our empirical estimations do indeed reveal such negative effects, but only in a certain range of discount expectations. When customers' discount expectations are lower than a particular threshold, they influence purchase behavior negatively. When they exceed this threshold, the effects become positive. Specifically, the thresholds of product-specific price discounts in the three equations (i.e., the vertexes in Fig. 4a, c, and e) are 31.00% ($=\exp(0*0.12+0.27)-1$), 27.40% ($=\exp(-0.232*0.12+0.27)-1$), and 17.74% ($=\exp(-0.889*0.12+0.27)-1$), respectively. Likewise, we expect negative effects of order coupon expectation on purchase incidence (H4a), purchase quantity (H4b), and spending (H4c) in H4. But we find order coupon expectations influence

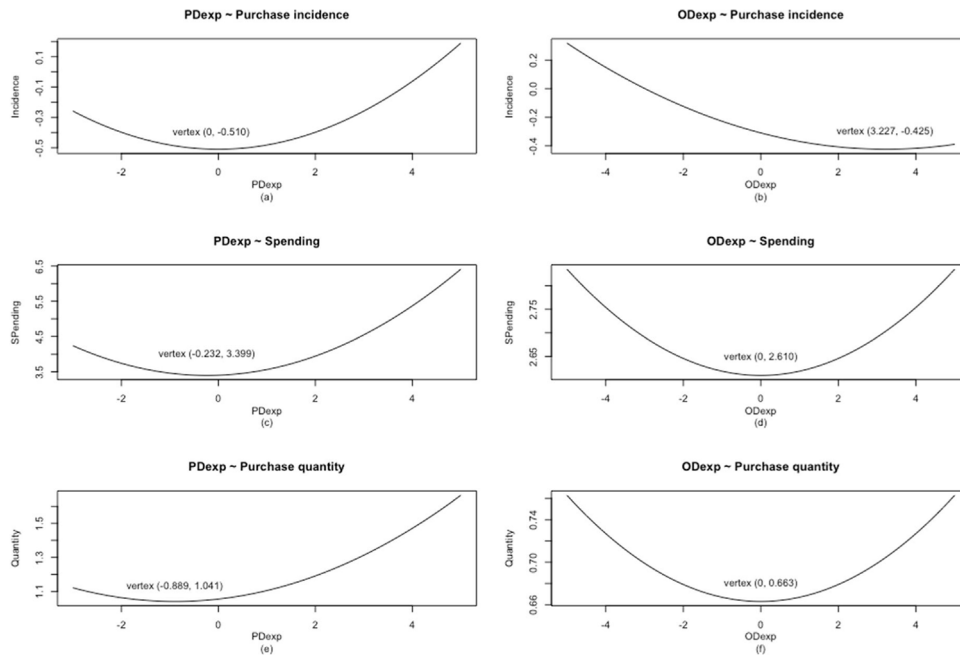


Fig. 4. Effects of consumers’ expectations of price discount (PDexp) and of order coupons (ODexp) on purchase incidence, spending, and purchase quantity. Note: Both PDexp and ODexp are standardized values.

the purchase behavior in a U-shaped pattern. The threshold of order coupon expectation in the purchase incidence equation is 426.12 CNY ($=\exp(3.227 \cdot 0.78 + 3.54) - 1$, Fig. 4b), while it is 33.47 CNY ($=\exp(0 \cdot 0.78 + 3.54) - 1$, Fig. 4d and f) in both equations for spending and purchase quantity. The negative effects of discount expectations below the cited threshold may result from a decrease in customers’ reference prices (e.g., Kalwani and Yim 1992), because the discounts (both product-specific price discounts and order coupons) redeemed in an order can be averaged for each product within the basket, thereby reducing the average price of the products. After consumers experience purchasing such products at “reduced prices,” they are less likely to purchase overall or are likely to purchase less when products are not offered at the “reduced prices.” Hence, a higher discount expectation leads to lower purchase possibility and actual purchases.

Another potential explanation for our findings on the effect of PD_{it} and OD_{it} on quantity is that customers with higher $PD_{exp_{it}}$ or $OD_{exp_{it}}$ had redeemed high discounts before, which led them to buy large quantities previously. Customers have specific, relatively stable demand for retail products in a given period (e.g., a year), so those who have purchased (i.e., stockpiled) a large quantity in a previous period are likely to have limited purchase demand in the current period (Blattberg and Neslin 1990). Thus, their purchase incidence and actual purchase amount will decline in week t . However, the positive effect of $PD_{exp_{it}}$ or $OD_{exp_{it}}$ on incidence, spending, and quantity above the cited threshold may result from customers’ spending and demand characteristics; that is, the focal retailer sends discounts to customers in accordance with their previous and current spending. Customers who have experienced very high average discount values on previous purchase occasions may also exhibit higher spending on average. Despite already purchasing more than other customers,

they still show higher purchase demand. These customers also believe that they will receive high discount values in the current period, which may improve their spending.

Moderating effect

Turning to the moderating effects of customers’ expectations of discounts, we find that the expectations for PD_{it} and OD_{it} positively interact with the current price discount and the current order coupon value respectively in the spending equation ($\beta_{PD_{exp} \cdot PD} = 0.033, p < .001$; $\beta_{OD_{exp} \cdot OD} = 0.010, p < .01$), which supports the interaction effects on customer spending but provides no evidence for H5 and H6. Our estimation suggests that the positive effect of product-specific price discounts on spending is moderated by customers’ expectations of price discounts. When product-specific price discounts are the same across customers, a customer with a lower expectation of the price discount (e.g., $PD_{exp_{it}} = -2.5$) spends more than a customer with a higher price discount (e.g., $PD_{exp_{it}} = 2.5$, Fig. 5a). This finding is consistent with our prediction that consumers will perceive more benefit when the difference between a current discount and their discount expectation is greater (Lattin and Bucklin 1989).

However, we also see from Fig. 5a that, when the discount value is relatively high, consumers with a higher price discount expectation spend more than customers with a lower expectation. A customer who has experienced higher price discounts (i.e., higher expectation) and who redeems a higher price discount for the current order may be a customer who has high deal-proneness. Deal-prone customers tend to utilize different discount opportunities to obtain best deals and savings (Valentini, Neslin, and Montaguti 2020). This customer may also have a higher purchase demand, since a customer with a higher demand may spend more in general, and the retailer may intuitively target more discounts to such a customer. Similarly,

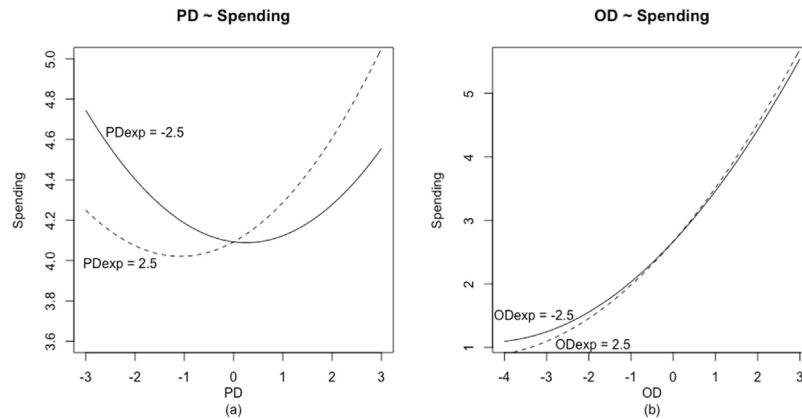


Fig. 5. Effects of price discounts (PD) and order coupons (OD) on spending with different customer expectations of price discount and coupon value. Note: PD, PDexp, OD, and ODexp are standardized values.

we find that customer expectations of order coupon value play a moderating role on the effect of order coupons on spending (see Fig. 5b).

Conclusions and implications

Small and medium-sized digital retailers provide discounts continuously to attract customers to purchase and in the hope of remaining competitive by building long-lasting relationships. We find that both product-specific price discounts and order coupons offered in a digital environment significantly influence customers’ actual spending and purchase quantity, but in quite different ways. In particular, we find that higher product-specific price discounts do not always stimulate consumers to spend more. They influence customer spending positively only when they are higher than 18.89%. Price discounts below this threshold influence spending negatively. On the other hand, product-specific price discounts positively affect the number of items purchased by customers in a given order, with a slope that levels off as the price discount value increases. Regarding order coupons, which are not limited to specific products, their values always show positive effects on customer spending and purchase quantity in their baskets. Moreover, the magnitudes of the positive effects of order coupons increase with increasing levels of the value of coupons.

These findings contribute to research on consumer responses to discounts by exploring a specific discount strategy adopted in many B2C digital channels, i.e., discounts continuously provided by retailers in digital channels. This study also contributes to the discount literature by delineating two types of price discounts. Although previous studies have noted that different discounts may exert divergent effects on customers’ purchase behavior (e.g., Levy et al. 2004), we do not know of any study that has analyzed and compared product-specific price discounts and order coupons. Our findings indicate that product-specific discounts and order coupons affect customers’ purchase behavior differently.

Moreover, our results show that customers’ price discount expectations, as approximated by the decaying weighted average of discount levels received previously, reduce consumer pur-

chase incidence and actual purchase behavior at lower levels and increase purchase incidence at higher levels. We identify different interactions of expectations of discounts with current discounts at different current discount levels. Breugelmans and Campo (2016) reported that previous discount frequency impairs discount effectiveness. We add nuance to this finding by showing that, for discounts (both product-specific price discounts and order coupons) at lower levels, relatively high discount expectations reduce a current discount’s positive effect on spending; however, when the discount values are relatively high, relatively high discount expectations enhance a current discount’s positive influence on customer spending.

Implications for online retailers

Our findings provide useful insights for digital retailers, especially for digital retailers active in hyper-competitive environments in which they strongly and continuously focus on discounts to attract customers. As both product-specific price discounts and order coupons influence customer purchase behavior in a nonlinear way, retailers should take care to design their discount strategies accordingly. In this study, we focused on the effects of discounts on purchasing, and our results have the following implications.

First, in order to have an effect on purchase behavior, retailers should provide relatively high product-specific price discounts. If the price discount is too low (i.e., lower than 19%), we observe a negative effect on spending. Only when price discounts are higher than 19% do higher price discounts attract customers to spend more in their baskets. Our results also show that the positive effect on quantity decreases with higher discounts. Taken together, these results suggest that lower product discount values are definitely not preferred. Besides, we show that when customers’ expectations of product price discounts are higher than 31%, 27%, and 18%, they positively affect customers’ purchase incidence in a week, spending, and purchase quantity in their baskets. This asks retailers to create sufficient discount expectations in the market in order to keep attracting customers. Take all together, in the hyper-competitive market under study,

our results support the use of continuous price discounts with sufficiently high values.

Second, our study suggests that firms can use relatively low-value order coupons. There are multiple reasons. We find that order coupon values positively influence spending and quantity in a basket whatever coupon values are. From this sense, the retailer should provide higher coupon value. Moreover, if considering the U-shaped effects of customer expectations of order coupons, only when order coupon expectations are higher than 426 CNY they positively influence customer purchase incidence at the retailer in a given week; when order coupon expectations are higher than 34 CNY, they affect spending and purchase quantity in a basket positively. In this vein, the retailer may need to keep order coupon values higher than 426 CNY continuously to assure that both order coupon values and coupon expectations positively influence customer purchase incidence, spending, and purchase quantity. However, given that order coupons affect the margin on the total basket, care should be taken to provide order coupons with very high value. Therefore, we do not suggest that the retailer keep coupon values higher than the maximal threshold—426 CNY. Instead, we suggest keeping order coupon values at relatively lower levels. There are two choices here, i.e., coupon values higher than 34 CNY but lower than 426 CNY and coupon values lower than 34 CNY. In the first choice, coupon value expectations between 34 CNY and 426 CNY may lead to very low purchase incidence (see Fig. 4b where the value on x axis is between zero and the vertex). In the second choice 2, coupon value lower than 34 CNY may lead customers to have lower spending and purchase quantity (see Fig. 3b and d where the value on x axis is lower than zero). Therefore, whether selecting the first or the second choice depends on the retailer's aim, i.e., whether it plans to stimulate more spending and purchase quantity or to induce more customers to purchase.

Third, our results suggest that the effect of a discount increases when the discount exceeds the modeled expectation, which implies that discounts should not be below customer expectations. This supports the use of discount tactics that are continuous but also consistent.

Finally, note that we did not calculate profit consequences. This means that we cannot provide implications for optimal discount levels, but only insights based on purchase outcomes without considering margin consequences. Given that discounts erode margins and that our results suggest a need for high-value product discounts and continuous deep discounting to meet customer expectations, retailers should consider the (long-term) profit implications carefully.

Limitations and future research

This initial study, using actual transactional data, of the effects of two types of permanent discounts provided in digital channels partly confirms our predictions and advances new insights. However, it also suffers several limitations. We have access to data from only one digital retailer, and the data period is just one year. Richer data, including information from multiple retailers over a longer period, could usefully test the generalizability of our findings. Further, we do not know the costs of

products in our data set, information that would clarify the influence of this discount strategy on retailer profits. Although we know how much of the value of a coupon is redeemed in an order (in our case, average redeemed coupon value ratio is 64% at the individual level), we lack information about coupon expiry dates. In addition, we have examined the influence of product-specific price discounts on purchase quantity and spending at the basket level. If appropriate data is available, future studies could examine the effect of price discounts at the product level to see how a price discount impacts the purchase outcomes of a featured product. It would also be useful to explore whether higher price discounts trigger cross-buying behavior, as this would help to explain why price discounts induce higher spending. Finally, the nature of our data prevents us from establishing the effect of current discount levels on purchase incidence.

Despite these limitations, this study offers useful insights regarding the unique influences of product-specific discounts and coupons on customer purchasing behavior. Accordingly, we note some promising directions for future research. First, experimental data could be used to determine the causal relationship between digital discounts and customer spending. Second, researchers could test for the effects of product category on the two types of discount strategies; consumers may exhibit varying (discount) sensitivity across categories, and retailers will obtain different profit levels across categories, depending on their margins. Third, consumer responses to discounts may vary across online and mobile channels; further research should determine whether such a difference exists and how retailers can best differentiate these channels in their overall marketing strategies. Fourth, attribution models, instead of aggregate measures, could be used to address the roles of different digital channels and their contributions to retailer sales and revenues. Fifth, advanced technologies (e.g., artificial intelligence) may help digital retailers to apply the permanent discounts strategy in a more efficient way, for example, by targeting different customers in real time on the basis of their particular demographic and behavioral characteristics. We anticipate more studies of the combination of digital channels and other technologies in terms of their influence on customer purchase behavior. Such research would extend the findings of the present study in valuable ways.

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