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Post-promotion redemption, exposure, and spillover effects of electronic coupons: An empirical analysis

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Abstract

Coupon promotions have been increasingly used with the development of electronic commerce technologies. The post-promotion effects of coupon promotions have been mixed. Using a randomly selected customer sample at a firm that operates a large online classified ads website, we examine the exposure, redemption, and spillover effects of coupon promotions. We find a negative exposure effect and a positive redemption effect. For customers who received coupons but did not redeem them (i.e., exposure effect), they purchased less than those who did not receive coupons after the promotion ends; and for the customers who redeemed coupons (i.e., redemption effect), they purchased more than those who did not redeem them after the promotion ends. We find that the positive redemption and negative exposure effects can spill over to other products that are not on promotion (i.e., spillover effect). Further investigations show that the negative exposure effect is exacerbated when customers purchase more often. Managerial and theoretical implications are discussed.

KEYWORDS
electronic coupons, exposure effect, redemption effect, spillover effect

1 | INTRODUCTION

Coupons, as an important price promotion tool, have been popular among firms since 1985 when C. W. Post introduced the first cents-off coupon to customers for purchasing his Grape-Nuts cereal (Antil, 1985). In recent decades, along with the development of electronic commerce and personal digital devices, firms have started increasingly using electronic coupons (Tseng & Chang, 2015). It was estimated that 169 billion manufacturer-funded coupons (both print and electronic coupons) were distributed during the first 6 months of 2016 in North America, among which 1.2 billion were redeemed. Therefore, understanding how coupons work effectively in today's competitive business context has become an important issue for marketing managers when they plan their coupon campaigns.

Prior literature has examined the effect of coupon promotions extensively with various foci on redemption rates (e.g., Chiou-Wei & Inman, 2008), conditions on redemptions (e.g., Danaher et al., 2015; Ghose et al., 2019), redemption and exposure effect (e.g., Srinivasan et al., 1995), and short-term effects during promotion and long-term effects after promotion (Lu et al., 2013).[1] There is a general consensus that the short-term effect of coupon promotions is positive on customer purchases; that is, customers tend to purchase more using coupons (DelVecchio et al., 2006). However, there has not been a consensus on the long-term effect of coupon promotions on customer purchases after the promotion is over. On the positive side, some studies find that price promotions can improve customers' post-promotion preference through purchase reinforcement with the formation of learning and habit (e.g., Blattberg & Neslin, 1989), whereas on the negative side, other studies show that price promotions may adversely affect customers' perceived quality and satisfaction as well as their brand loyalty on the promoted products and firms, thereby lowering the future purchase intentions (e.g., Papatla & Krishnamurthi, 1996; Villarejo-Ramos & Sánchez-Franco, 2005).

We intend to make contributions to the ongoing debate by studying the coupons' post-promotion effects using a unique dataset. Using data from a firm that owns and operates a large online classified ads website, we examine exposure, redemption, and spillover effects. Our key findings are as follows: (1) Redemption of and exposure to electronic coupons

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have opposite effects on customer purchases. Customers who received but did not redeem a coupon (i.e., exposure effect) tend to purchase less than those who did not receive coupons, whereas customers who redeemed coupons (i.e., redemption effect) tend to purchase more than those who did not redeem them. (2) The positive redemption and the negative exposure effects can also spill over to other products that are not on promotion. (3) The negative exposure effect is exacerbated when customers purchase more often. Our findings suggest that the exposure effect is more detrimental to customers' brand loyalty than helpful in mitigating the uncertainty and risk associated with the product and firm and that the redemption effect, on the contrary, is more helpful in reducing the uncertainty and risk associated with the product and firm than harmful in lowering reservation or reference prices and brand loyalty, likely due to the direct experience from buying and using the products.

Our findings make a number of important contributions. First, we make theoretical contributions to the debate on whether the post-promotion effect of coupon promotions is positive or negative by carefully crafting an econometric analysis strategy that mitigates the empirical challenges. Our findings support the view that the customers who are exposed to the coupon promotion but do not redeem them purchase less after the coupon promotion ends (e.g., Cox & Cox, 2002; Lattin & Bucklin, 1989), and the view that customers who redeem purchase more after the coupon promotion ends (e.g., Bawa & Shoemaker, 1989; Venkatesan & Farris, 2012).

Second, few papers have examined the post-promotion effects of electronic coupons. Electronic coupons have two distinct features from traditional print coupons. First, the speed of the coupon cycle is much shorter. That is, the distribution and redemption of electronic coupons are much faster, and the post-promotion effect of electronic coupons is also fading away faster, typically in days as compared with print coupons typically in weeks or months (Breuer & Brettel, 2012). Second, the number and variety of electronic coupons are much greater than print coupons due to lowered costs (Cheng & Dogan, 2008). Our findings on the post-promotion effects of redemption and exposure are especially insightful for electronic coupons. Our findings suggest that the conventional wisdom for firms to send as many low-cost electronic coupons as possible is not a good idea. While the firm may see immediate sales bumps during the coupon promotions, they will pay after the coupon promotions end. Our findings show that in the long term, exposure to coupons may hurt brand loyalty, thereby reducing customer purchases. Our study is among the initial effort to study the post-promotion effects of electronic coupons.

The rest of the paper is structured as follows. Section 2 discusses the theory and develops hypotheses. Section 3 describes our research setting, data, variables, and econometric models. Section 4 presents the analysis and results. Section 5 discusses the results, theoretical and managerial implications, research limitations, and future directions.

2 | THEORY AND HYPOTHESES

2.1 | Coupon's post-promotion effect

Coupon promotions have been studied extensively in the marketing literature. Most of the discussion is focused on the redemption rate (e.g., Chiou-Wei & Inman, 2008; Inman & McAlister, 1994) and the factors on the redemption rate (e.g., Danaher et al., 2015; Reibstein & Traver, 1982). More recently, the studies on coupon promotions have expanded into the areas of post-promotion effects.

The empirical outcomes of the coupons' post-promotion effect have been mixed (e.g., Blattberg et al., 1995; DelVecchio et al., 2006; Papatla & Krishnamurthi, 1996). On the positive side, coupon promotions may increase customers' post-promotion purchases through purchase reinforcement with the formation of learning and habit (Blattberg & Neslin, 1989). On the negative side, coupon promotions may adversely affect customers' perceived quality, increase customers' price sensitivity (e.g., Papatla & Krishnamurthi, 1996), and reduce satisfaction and brand loyalty to the promoted products (e.g., Papatla & Krishnamurthi, 1996; Villarejo-Ramos & Sánchez-Franco, 2005), thereby lowering future purchase intentions.

The theoretical underpinning of the positive post-promotion effect is three-fold. First, coupon promotions facilitate information exchange through which customers can save search costs and obtain information about the products and firms. More information on products and firms is correlated with higher purchase intentions (e.g., Jayawardhena et al., 2007; Weathers et al., 2007). Without coupons, customers who are in need of a product have to spend extra effort and time to search and compare products and firms. Coupons inform customers of a product and firm and encourage customers to investigate a firm and its product offerings that they are not aware of. Coupons can reduce customers' search costs (if customers decide to buy a product using a coupon and do not search for other alternative products and firms). Second, coupon promotions help generate customers' gratitude toward the firm for receiving coupons (Venkatesan & Farris, 2012). If customers end up saving money through coupon redemption, they retain positive gratitude toward the firm. Even if customers do not redeem the coupons, they may simply appreciate the firm for thinking of them by sending them the coupons. Such positive gratitude may induce more purchases in the future (Palmatier et al., 2009; Venkatesan & Farris, 2012). Third, because promotions attract customers to make additional purchases of a product, it indirectly results in more learning and habit formation. Promotions may induce the first-trial experience, thereby enhancing customer loyalty and repurchase probability (DelVecchio et al., 2006).

Coupon promotions may have adverse effects. First, coupon promotions may reduce customers' reservation prices (i.e., the price they are willing to pay) or reference price (i.e., the price used as a reference to evaluate a brand or a product). When customers observe coupon price promotions for a

TABLE 1 Summary of relevant literature

Literature	Context	Exposure effect	Redemption effect	Spillover effect	Methodology	Mechanism
Bawa and Shoemaker (1989)	Print coupons	+	+		Logit model	Reduced risk or cost, purchase reminder
Lattin and Bucklin (1989)	Promotions	−			Multinomial logit model	Reduced reference price
Venkatesan and Farris (2012)	Print coupons	+	+		Bayesian model	Facilitating information exchange and learning, generating gratitude
Sahni et al. (2017)	Email promotional offers	+	+	+	Field experiments	Purchase reminder
Papatla and Krishnamurthi (1996)	Print coupons		−		Probit model	Reduced reference price
Srinivasan et al. (1995)	Print coupons	+		− On competing brand	Panel data analysis	Facilitating information exchange and learning
Erdem and Sun (2002)	Advertising and sales promotions			+	Multinomial probit model	Uncertainty reduction in other products under umbrella brands
This study	Electronic coupons	−	+	− Spillover exposure + Spillover redemption	Regression model	Combined force of the positive and negative coupon effects

product, they may lower their reservation or reference prices for the product and regard the discounted price as the fair price, and they will not buy the product if the price is higher than the coupon discounted price (Lattin & Bucklin, 1989; Papatla & Krishnamurthi, 1996; Winer, 1986). For example, if a product had a 10% discount yesterday, customers may not be willing to pay a full price today due to a lowered reservation or reference price. Customers become more price-sensitive, especially when promotions are frequently offered. Second, coupon promotions may reduce customers' perceived quality of the firm, brand, and product. Price discounts, in general, weaken brand equity despite the short-term benefits that they provide to consumers (Villarejo-Ramos & Sánchez-Franco, 2005). Customers may view the product and the firm as of low quality when they observe price discounts for the products from the firm. The reduced perceived quality of the brand and product results in lowered brand loyalty, thus reducing future purchase probabilities after promotion (Papatla & Krishnamurthi, 1996). Third, consumers may stockpile promoted products and reduce their future purchases (e.g., Helsen & Schmittlein, 1992; Mela et al., 1998, Sun, 2005). Table 1 summarizes relevant studies in the literature and highlights the differences of this paper from these studies.

2.2 | Exposure effect

Besides the role of a price promotional tool to increase short-term sales (Hoffman et al., 1992), coupons serve as a means to communicate with the customers about the product offerings. From receiving, reading, and investigating the product offerings and the firm on the coupon, customers can obtain information about the product, price, and firm, without incurring additional search costs. Even if the customers do not redeem the coupon, they may purchase the product from the firm after the coupon promotions end simply because of more information and convenience (i.e., they have more information and do not have to incur additional costs to search). This long-term post-promotion effect brought by just exposure to coupons is defined as the exposure effect (e.g., Owens et al., 2001; Srinivasan et al., 1995).

A few papers in the literature have studied the exposure effect. For instance, Ghose and Todri-Adamopoulos (2016) find statistically and economically significant effects of display advertising on increasing consumers' propensity to make a purchase. Furthermore, some papers find that coupon promotions have a positive effect on customer purchases and induce sales even when customers do not redeem the coupons (e.g., Bawa & Shoemaker, 1989; Leclerc & Little, 1997; Srinivasan et al., 1995; Venkatesan & Farris, 2012). For example, by using scanner purchase data from a large-scale coupon experiment, Bawa and Shoemaker (1989) show incremental sales among non-redeemer households, indicating a positive exposure effect. Similarly, Venkatesan and Farris (2012) analyze the experiment data from a group of regional grocery chains and discover that retailer-customized coupon campaigns exert positive exposure effects on customer purchases.

Meanwhile, exposure to coupon promotions may adversely affect a customer's perceived quality of the firm and products and reservation or reference price. This effect is particularly prevalent to the customers who are exposed to the coupons but do not redeem them for various reasons. For example, by

using IRI scanner panel data, Lattin and Bucklin (1989) find that prior exposure to promotions may decrease customers' reference price from regular price to discounted price, and thus negatively impact their subsequent purchase intention when there is no promotion.

The current research has not reached a consensus on the exposure effect possibly due to the different research contexts. Most of the aforementioned studies focus on the consumer packaged goods market, where consumers face many competing brands with frequent promotions. Consumers' choices are affected by collective promotions launched by different brands. For example, Bawa and Shoemaker's (1989) result of a positive exposure effect is based on a field experiment where a solo coupon for an established brand was mailed to consumers when competitive promotions were stable. On the contrary, Lattin and Bucklin's (1989) finding of a negative exposure effect comes from secondary IRI scanner data on four competing coffee brands with frequent price promotions. Our empirical context is different from the above literature. First, our focal firm is a dominating classified ads website selling top ad positions on its classified ads website. Contrary to the consumer packaged goods market, customers can post ads for free. Second, the services that are provided immediately after purchase and cannot be stockpiled regardless of their promotion statuses. Hence, the coupon's post-promotion exposure effect is determined by the tradeoff between the positive and negative effects. Given the debate in the literature, the exposure effect is subject to an empirical test. We propose the following competing hypotheses:

H1a. *Customers who are offered but do not redeem the coupons for a product are more likely to purchase the product after the promotion ends than those who are not offered the coupons*.

H1b. *Customers who are offered but do not redeem the coupons for a product are less likely to purchase the product after the promotion ends than those who are not offered the coupons*.

2.3 | Redemption effect

We consider the incremental redemption effect beyond the exposure effect. That is, we compare the effect on the customers who have redeemed the coupons with the effect on the customers who are offered but do not redeem the coupons. The difference between the customers who redeem the coupons and those who do not is that the former gain direct experience from buying and using the products. Such experience helps decrease customers' perceptions of uncertainty and risk associated with the firm and the products and, in turn, mitigates the negative impact of coupon promotions such as lowered reservation and reference prices and brand loyalty. For example, customers may not purchase a product due to the uncertainty and risk associated with the products and firm, or customers may be unsure about the effectiveness of the product and the net utility after factoring in the price, therefore having a lower reservation price. The coupon promotions provide customers with a temporarily lowered price that is lower than the reservation price so that the customers decide to purchase and use the product. Once having redeemed the coupons, purchased and used the products, customers' perceived uncertainty and risk associated with the product and firm will be reduced, resulting in a higher reservation price. As a result, after the coupon promotions end, the customers may have a greater chance to purchase even if the prices are increased to the normal prices. Although researchers find promotions accelerate consumer purchase (e.g., Helsen & Schmittlein, 1992; Mela et al., 1998, Sun, 2005), consumer stockpiling behavior does not apply to our empirical context. The studied firm offers services that are provided immediately after purchase and cannot be stockpiled regardless of their promotion statuses.

Hence, we posit that customers who have redeemed coupons are more likely to purchase again after coupon promotions end. We have the following hypothesis:

H2. *Customers who are offered and have redeemed the coupons for a product are more likely to purchase the product after the promotion ends than those who are offered but do not redeem the coupons*.

2.4 | Spillover effect

The exposure and redemption effects may spill over to other products that are not on promotion. That is, customers who are offered a coupon or have redeemed one may exhibit different purchase patterns on nonpromoted products than customers who are not offered or have not redeemed a coupon.

The mechanism for the spillover effect is cross-learning. That is, customers' purchase and usage experience in one product influence their perceptions of quality and price in other products of the same firm (Erdem & Sun, 2002). The customer experience from using the product can serve as a credible signal of quality and brand image for related products, especially those with the same brand, which improves customers' purchase intention for the related products (Cabral, 2000). In addition, the experience also helps reduce the customer perception of uncertainty and risk associated with the purchase process and effectiveness of the product since the purchase process and the product are similar and relevant (Jayawardhena et al., 2007; Weathers et al., 2007). For example, using ACNielsen scanner panel data, Erdem and Sun (2002) show that the usage experience in one product acts as a mechanism of reducing uncertainty for other products within the umbrella brands, thus helping to increase the sales of the other products. Using experiments through a ticket resale platform, Sahni et al. (2017) find evidence for cross-category spillovers where offers on one ticket genre cause an increase in spending in another nonpromoted genre.

The spillover effect due to cross-learning has been widely documented in the learning literature. Learning may result from spillovers from experience with similar processes due to spillovers from other organizations or processes (e.g., Argote et al., 1990; Iyengar et al., 2015). For example, Argote et al. (1990) find that organizations beginning production at a later date (i.e., late movers) are more productive than those with early start dates (i.e., early movers); and Dyer and Hatch (2006) find that knowledge-sharing of previous practices on the part of Toyota was positively correlated with the rate of learning for suppliers, and Yao et al. (2012) show that knowledge from an electronic data interchange implementation between a manufacturer and distributor may result in learning spillovers to a later vendor-managed inventory implementation at the same manufacturer–distributor dyad.

In our study, customers who have redeemed coupons in one product are able to attain purchase and usage experience, thereby resulting in reduced perception of uncertainty and risk associated with the other products and the firm as a whole. We posit the perception may spill over to other products within the firm, thereby increasing the customer purchases of the other products. We have the following hypothesis:

H3. *Customers who are offered and have redeemed the coupons for a product are more likely to purchase other nonpromoted products after the promotion ends than those who are offered but have not redeemed the coupons*.

Similar to the redemption effect, the exposure effect may also spill over to other products. As discussed above, coupon promotions facilitate information exchange through which customers can save search costs and obtain more information about products and firms, and coupon promotions generate customers' gratitude toward the store for receiving coupons (Venkatesan & Farris, 2012). When customers receive coupons, although they do redeem them, they may learn about the firm, thereby saving on the search cost for the firm. Therefore, they may also gain gratitude toward the firm as a whole, which may carry over to other products offered by the firm. The potential negative effect can be spilled over as well. Due to promotions, customers may lower their perception of the quality, reservation price, and brand loyalty of nonpromoted products, resulting in lowered purchase intentions. Similar to our development of H1, we have the competing hypotheses:

H4a. *Customers who are offered but have not redeemed the coupons for a product are more likely to purchase other nonpromoted products after the promotion ends than those who are not offered coupons*.

H4b. *Customers who are offered but have not redeemed the coupons for a product are less likely to purchase other nonpromoted products after the promotion ends than those who are not offered coupons*.

3 | EMPIRICAL CONTEXT, DATA, AND MODELS

3.1 | Research setting

The research setting of this study is a firm that owns and operates one of the largest classified ads websites in China. The operations revenue in 2016 was RMB 340 million.[2] The website serves local markets across the country and is organized by city–category pairs (e.g., Shanghai–used cars). Each city–category pair corresponds to a separate webpage, on which registered customers can post their ads and visitors can browse the ads. For example, the webpage of "Shanghai–used cars" is for customers to post ads to sell used cars in Shanghai. As of 2017, the website serves 367 cities across the entire country and 209 product or service categories, including vehicles, real estate, used items, pets, jobs, blind dating, educational training, and so forth.

Registered customers can choose any city–category webpage to post ads for free. The posted ads are listed on the webpage with key information (e.g., product, price) and a link to the ad page with detailed information (e.g., description, picture, location, contact, etc.). A visitor can browse the list of ads on any webpage without an account and navigate to the ad page with detailed information by clicking on the link of an ad on the list. As of September 2016, the website had more than 100 million active customers and received more than 10 million new ads every month.

A webpage can list many ads from the top to the bottom that are sorted by the time posted. With many ads posted every day, an ad sinks to the bottom of a webpage or even the next page in a few hours, where it receives much less online traffic (Ghose & Yang, 2009). Hence, the top positions on a webpage are more valuable to the customers than the bottom positions. The firm sells a limited number of top positions through various service offerings; for example, two popular ones are Sticky and Urgent services. Once purchased, both Sticky and Urgent services allow a customer's ad to remain in one of the top positions for a period of time. Customers cannot delay either service after purchase and thus do not have a chance to stockpile the service. Sticky and Urgent services are different from each other in that Urgent service ads are positioned on top of the Sticky service ads and are costlier.

Figure 1 presents a screenshot of Sticky and Urgent services on the "Shanghai–used cars" webpage. When a customer purchases the Sticky service, the ad is marked with a Sticky icon and listed in the top section of the webpage. Similarly, when a customer purchases the Urgent service, the ad is marked with an Urgent icon and listed in the top section even higher than the Sticky ads on a webpage. Customers can also choose to purchase different lengths of the time periods for the services (e.g., 1 day, 3 days, 1 week, etc.), and longer time periods are more expensive. For example, Sticky service on "Shanghai–used cars" webpage costs RMB 486 for 3 days and RMB 756 for a week.

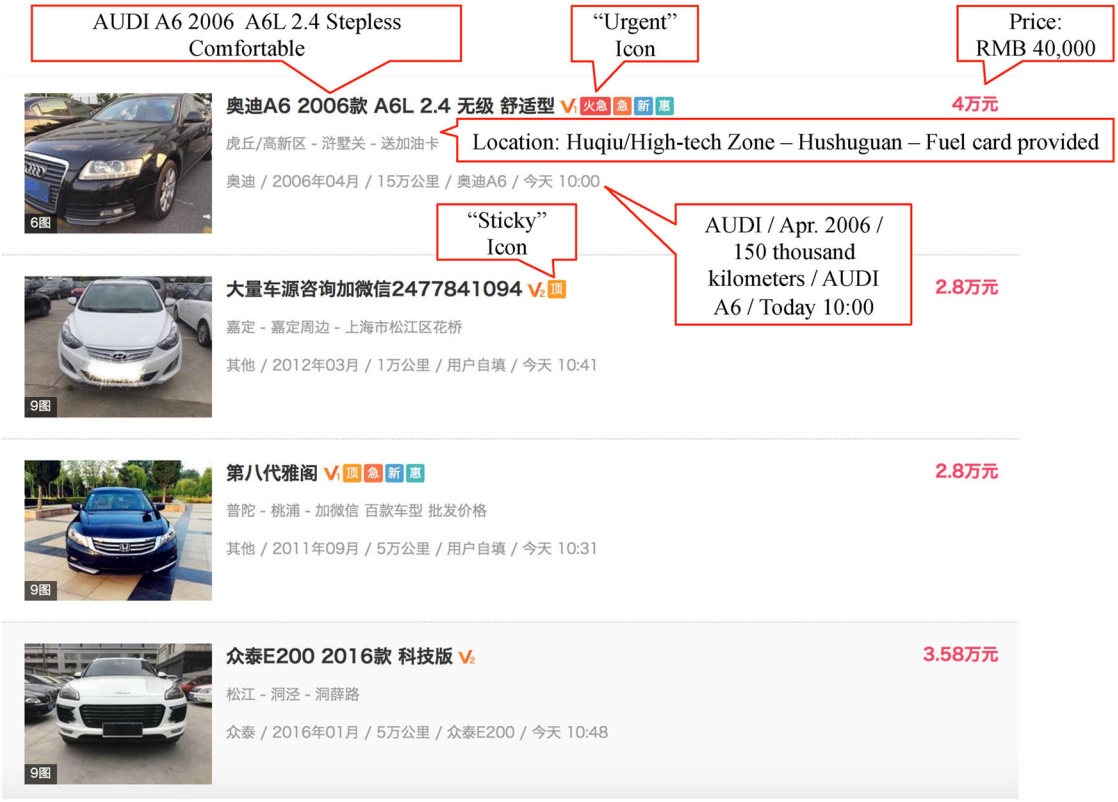

FIGURE 1 A screenshot of Sticky and Urgent services on a webpage. *Note*: The texts in the callout boxes are our translations. [Color figure can be viewed at wileyonlinelibrary.com]

Because it is free for customers to post ads on the website and for visitors to browse, the for-charge services are the main revenue sources for the firm. In order to encourage customers to purchase the services, the firm uses electronic coupons to conduct marketing campaigns regularly. Coupons are dropped to customers' accounts electronically. Once the coupons are dropped, text messages and/or emails are sent to the customers as a reminder. Customers can check and use the coupons in their accounts by clicking on the link on the coupon. The key information for coupons includes their face value (e.g., RMB 10), time period (from-to), city (e.g., Shanghai), category (e.g., used cars), and type of service (e.g., Sticky service). A coupon can only be redeemed within the valid time period, in the valid city–category pair and for the valid service type.

3.2 | Data

We collected data from the firm to examine the exposure effect, the redemption effect, and the spillover effect of electronic coupons. We collaborated with the firm and randomly selected a set of customers from the firm's customer database who were active during a 7-month period (August 2014 to March 2015). Among these customers, one group of them never received any coupons, and the other group received coupons. For the group of customers who received coupons, they received only one coupon during the data collection period so that we can isolate the coupon effects. The coupons were of different amounts and different types of service. We also obtained data on the customers' purchases days prior to the coupon drops and days post the coupon expirations.

In particular, 100,019 customers in total were randomly selected. Among them, 64,245 customers received coupons, and 35,774 customers did not receive coupons. For those who received coupons, 23,770 customers received the coupons for Sticky services, and 40,475 customers received the coupons for Urgent services. Again, since all selected customers only received one coupon only, the customers who received Sticky or Urgent service coupons are mutually exclusive; that is, no customers received both coupons. Among the coupons, for the Sticky services, 16,166 coupons were in the amount of RMB 2, and 7604 coupons were dropped in the amount of RMB 4; for the Urgent services, 27,175 coupons were in the amount of RMB 3, and 13,300 coupons were in the amount of RMB 6. Figure 2 depicts the groups of customers in our data.

The data were collected during a 7-month period. The customers received coupons throughout the months over time rather than on a certain day so that the effect from possible random events during a particular day is evened out (Kumar & Tan, 2015). All coupons are valid for 3 days. We use the data during the 180 days before the coupon drops to determine the pre-promotion customer purchase rates and the data

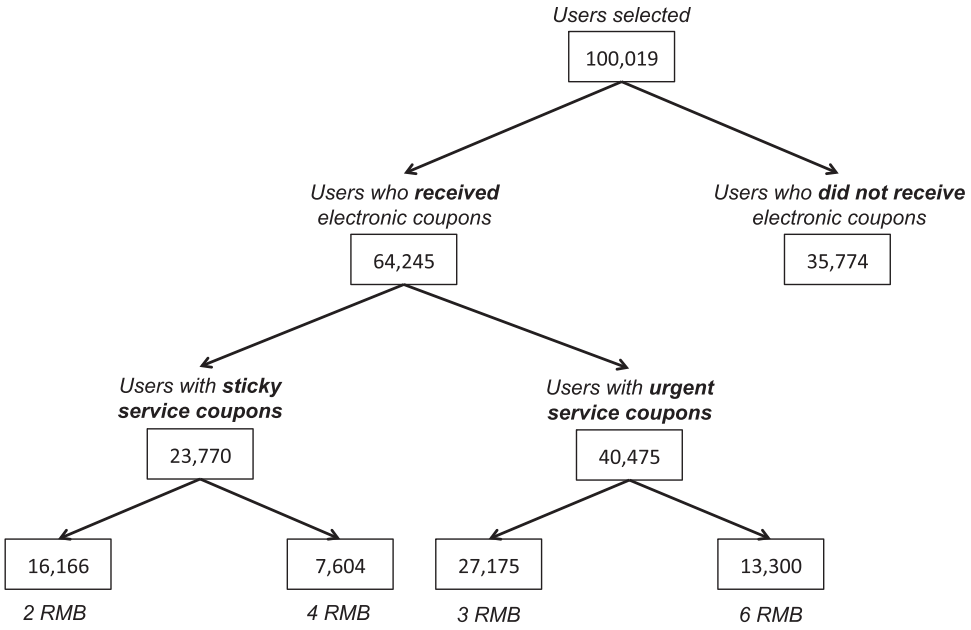

FIGURE 2 Randomly selected customer sample

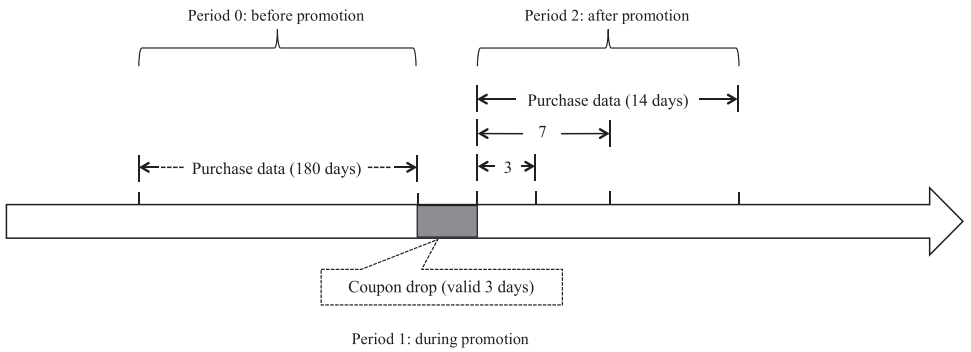

FIGURE 3 Timeline of data collection

during the 7 days after the coupon expiration to determine the post-promotion customer purchase rates.[3] Figure 3 illustrates the time intervals of the coupon promotions and the data collections, where we define Periods 0, 1, and 2 as before, during, and after promotion, respectively.

Figure 4 presents the redemption rates by face values and by services. For the Sticky service, the average redemption rate for all coupons is 6.80%. Not surprisingly, it increases with the face value; that is, 5.75% for the coupons with the face value of RMB 2 and 9.03% for the coupons with the face value of RMB 4. For the Urgent service, the average redemption rate for all coupons is 5.23%, and it also increases as the face value becomes higher (i.e., 4.29% for coupons with the face value of RMB 3 and 7.15% for coupons with the face value of RMB 6). Figure 5 presents the average purchase rates per day per customer before the promotion by services. The average purchase rates for Sticky service and Urgent service are 0.0304 and 0.0264, respectively, suggesting that 3.04% of customers purchased Sticky services and 2.64% of customers purchased Urgent services during a day.

3.3 | Econometric models

3.3.1 | Exposure effect

We estimate the exposure effect and redemption effect separately. The customers who received coupons were not randomly selected. The firm used parameters based on recency, frequency, and monetary value (RFM) to select customers who would get a coupon. Hence, we construct a system of two equations to model the pre-promotion selection process and the post-promotion exposure effect. Recall Periods 0, 1, and 2 denote the time interval before, during, and after promotion, respectively. Equation (1) models the firm's coupon-dropping decision before promotion in period 0. The dependent

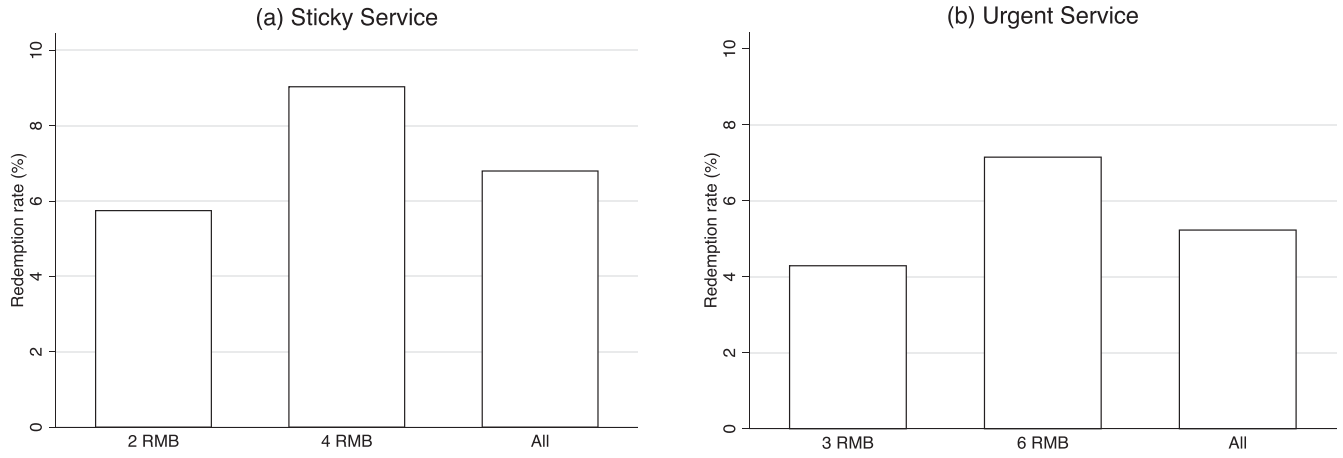

FIGURE 4 Redemption rates

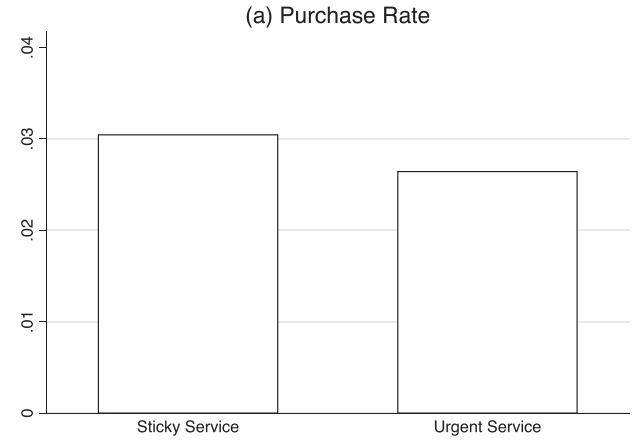

FIGURE 5 Purchase rates prior to promotions

variable $DROPPING_{i0}$ indicates the firm's coupon-dropping decision to customer i. $DROPPING_{i0} = 1$ when customer i received a coupon, and $DROPPING_{i0} = 0$ otherwise. Following Sahni et al. (2017) and our interviews with the firm, we use RFM model to predict the firm's coupon-dropping decision. Some customers who received a coupon had not yet done any transaction. The recency for these customers is missing. Therefore, we do not include recency but include the number of purchases ($FREQUENCY_{i0}$) and the monetary value of the transactions ($MONETARY\_VALUE_{i0}$) that customer i made 90 days prior to the coupon drop in the pre-promotion period 0.[4] Since the firm's coupon-dropping decision is also related to its past coupon-dropping decision, the total discount value the firm issued in coupons for the Sticky services ($STICKY\_COUPON_{i0}$) and Urgent services ($URGENT\_COUPON_{i0}$) a day before are also included. Since the firm's coupon-dropping decision is not related to customers' post-promotion purchase behavior, $STICKY\_COUPON_{i0}$ and $URGENT\_COUPON_{i0}$ serve as exclusion restrictions in the system of equations. $HIGH\_VALUE_{i0}$ is an indicator of the coupon face value. $HIGH\_VALU\ E_{i0} = 1$ when a customer received a high valued coupon (a face value of RMB 4 for coupons on Sticky services and a face value of RMB 6 for coupons on Urgent services), and $HIGH\_VALU\ E_{i0} = 0$ otherwise. $\in_{i0}$ is the error term.

Equation (2) models the exposure effect after coupon drops after promotion in Period 2. The dependent variable $PURCHASE\_RATE_{i2}$ is customer i's average purchase count per day. The independent variable is $DROPPING_{i0}$, which is the dependent variable in Equation (1). Its coefficient γ_1 denotes the exposure effect. We control customers' heterogeneity by including their past purchase behaviors: $FREQUENCY_{i(0,1)}$ is customer i's purchase frequency before the coupon drops and during the life of the coupon in Periods 0 and 1, and $MONETARY\_VALUE_{i(0,1)}$ is the monetary value spent by customer i before and during the promotion. We also control the heterogeneous effect of different coupon face values by including $HIGH\_VALUE_{i0}$. η_{i2} is the error term.

$$\begin{aligned} DROPPING_{i0} = {} & \alpha_0 + \alpha_1 FREQUENCY_{i0} + \alpha_2 MONETARY\_VALUE_{i0} \\ & + \alpha_3 HIGH\_VALUE_{i0} \alpha_4 STICKY\_COUPON_{i0} \\ & + \alpha_5 URGENT\_COUPON_{i0} + \in_{i0}, \end{aligned} \tag{1}$$

$$\begin{aligned} PURCHASE\_RATE_{i2} = {} & \gamma_0 + \gamma_1 DROPPING_{i0} \\ & + \gamma_2 HIGH\_VALUE_{i0} + \gamma_3 FREQUENCY_{i(0,1)} \\ & + \gamma_4 MONETARY\_VALUE_{i(0,1)} + \eta_{i2}. \end{aligned} \tag{2}$$

3.3.2 | Redemption effect

A consumer's coupon redemption behavior, however, is not subject to the firm's selection process. Therefore, we use one equation to estimate the post-promotion redemption effect. We compare the post-promotion behavior of customers who redeemed a coupon to those who received but did not redeem a coupon. Equation (3) resembles Equation (2), except that the independent variable is $REDEMPTION_{i1}$.

TABLE 2 Descriptive statistics

	Customers receiving Sticky coupon (N = 23,770)				Customers receiving Urgent coupon (N = 40,475)				Customers not receiving a coupon (N = 35,774)			
	Mean	Std. dev.	Min	Max	Mean	Std. dev.	Min	Max	Mean	Std. dev.	Min	Max
$PURCHASE\_RATE_2$	3.68e-03	0.03	0	2.00	1.82e-03	0.02	0	2.29	9.87e-03	0.07	0	2.57
$SPILLOVER\_PURCHASE_2$	0.12	0.99	0	49.71	0.11	0.84	0	44.43	0.29	1.83	0	126.29
$DROPPING_0$	1	0	1	1	1	0	1	1	0	0	0	0
$HIGH\_VALUE_0$	0.32	0.47	0	1	0.33	0.47	0	1	0	0	0	0
$FREQUENCY_0$	0.05	0.44	0	22.57	0.05	0.51	0	40.43	0.14	0.88	0	39.68
$MONETARY\_VALUE_0$	2.15	31.56	0	2,800	2.16	23.15	0	2,000	53.85	372.05	0	29,477.99
$STICKY\_COUPON_0$	359.69	179.73	0	848	341.02	154.43	0	848	311.93	152.76	34	848
$URGENT\_COUPON_0$	878.22	474.52	0	1,965	1,015.08	452.94	0	1965	844.98	463.86	30	1965
$REDEMPTION_1$	0.07	0.25	0	1	0.05	0.22	0	1	0	0	0	0
$FREQUENCY_{(0,1)}$	0.05	0.45	0	23.41	0.05	0.52	0	39.48	0.15	0.90	0	40.80
$MONETARY\_VALUE_{(0,1)}$	6.24	75.17	0	6,426.67	5.30	59.90	0	8,787.74	68.74	404.72	0	29,585.61

Note: $PURCHASE\_RATE_2$ of customers not receiving a coupon is a summation of these customers' purchase rates on Sticky service and Urgent service. The estimated results are obtained by comparing post-promotion purchase rates by service separately.

TABLE 3 Urgent service correlation matrix (N = 76,249)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) $PURCHASE\_RATE_2$	1										
(2) $SPILLOVER\_PURCHASE_2$	0.11***	1									
(3) $DROPPING_0$	−0.02***	−0.07***	1								
(4) $HIGH\_VALUE_0$	1.48e-03	−0.01***	0.43***	1							
(5) $FREQUENCY_0$	0.09***	0.50***	−0.07***	−0.01	1						
(6) $MONETARY\_VALUE_0$	0.11***	0.11***	−0.10***	−0.04***	0.28***	1					
(7) $STICKY\_COUPON_0$	−3.18e-03	−4.33e-03	0.09***	0.04***	−7.54e-03*	−9.37e-03**	1				
(8) $URGENT\_COUPON_0$	−7.40e-03	−7.91e-03*	0.18***	0.07***	−0.02***	−0.02***	5.00***	1			
(9) $REDEMPTION_1$	0.11***	0.04***	0.16***	0.12***	0.02***	−0.01**	8.67e-03*	7.09e-03	1		
(10) $FREQUENCY_{(0,1)}$	0.10***	0.53***	−0.07***	−0.01***	1.00***	0.28***	−7.15e-03*	−0.02***	0.02***	1	
(11) $MONETARY\_VALUE_{(0,1)}$	0.10***	0.13***	−0.11***	−0.04***	0.27***	0.95***	−9.46e-03**	−0.02***	−1.12e-03	0.27***	1

Note: The number of observations is equal to the number of customers who received Urgent coupons and the number of customers who did not receive a coupon. N = 40,475 + 35,774 = 76,249. The Sticky service correlation matrix is available upon request. $^{+}p < 0.10$; $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$.

$REDEMPTIO\ N_{i1} = 1$ if customer i redeemed the coupon during promotion in Period 1, and $REDEMPTIO\ N_{i1} = 0$ otherwise. $REDEMPTION_{i1}$'s coefficient δ_1 indicates the redemption effect. Another difference between Equations (2) and (3) is the sample size.

$$PURCHASE_{RAT\ E_{i2}} = \delta_0 + \delta_1 REDEMPTION_{i1} + \delta_2 HIGH_{VALUE_{i0}} + \delta_3 FREQUENCY_{i(0,1)} + \delta_4 MONETARY\_VALUE_{i(0,1)} + \xi_{i2}, \quad (3)$$

where ξ_{i2} is error term.

To estimate the spillover effects, we develop a similar system of equations to estimate the spillover exposure effect and an equation for the spillover redemption effect. The only difference is that the dependent variable $SPILLOVER\_PURCHASE_{i2}$ is not the purchase rate for the services being promoted but other nonpromoted services.

Table 2 reports the summary statistics of the variables. Table 3 shows the correlation matrix. To check potential multicollinearity, we compute the variance inflation factor (VIF) scores for all independent variables in our models. The VIF scores for all independent and control variables are between 1.01 and 1.48, lower than the commonly accepted cutoff of 10 (Kennedy, 2003), indicating that multicollinearity is not a concern.

4 | RESULTS

4.1 | Estimation results

$\in_{i0}$ and η_{i2} may be correlated since the firm's coupon-dropping decision may be correlated with some unobserved pre-promotion consumer behavior, which is correlated with the consumer's post-promotion purchase. We use three-stage

TABLE 4 Estimation results (exposure effect and redemption effect)

	Sicky service			Urgent service		
	(1) $DROPPING_0$	(2) $PURCHASE\_RATE_2$	(3) $PURCHASE\_RATE_2$	(4) $DROPPING_0$	(5) $PURCHASE\_RATE_2$	(6) $PURCHASE\_RATE_2$
$HIGH\_VALUE_0$	0.69***	0.01***	1.00e-03+	0.56***	0.01***	5.04e-04+
	(0.01)	(2.19e-03)	(5.17e-04)	(4.37e-03)	(7.40e-04)	(2.74e-04)
$FREQUENCY_0$	−0.03***			−0.03***		
	(2.50e-03)			(2.40e-03)		
$MONETARY\_VALUE_0$	−9.13e-05***			−1.34e-04***		
	(6.26e-06)			(6.51e-06)		
$STICKY\_COUPON_0$	4.17e-05***			6.59e-06		
	(1.22e-05)			(1.20e-05)		
$URGENT\_COUPON_0$	−4.97e-05***			1.58e-04***		
	(4.29e-06)			(4.02e-06)		
$DROPPING_0$		−0.03***			−0.01***	
		(3.01e-03)			(1.21e-03)	
$REDEMPTION_1$			0.02***			0.02***
			(2.06e-03)			(1.80e-03)
$FREQUENCY_{(0,1)}$		0.01***	1.89e-03*		2.65e-03***	8.96e-04
		(2.92e-04)	(7.84e-04)		(1.48e-04)	(5.55e-04)
$MONETARY\_VALUE_{(0,1)}$		8.49e-06***	8.33e-07		7.68e-06***	3.02e-06
		(7.16e-07)	(2.77e-06)		(3.96e-07)	(2.69e-06)
Intercept	0.21***	0.01***	1.63e-03***	0.28***	0.01***	5.15e04***
	(4.30e-03)	(9.50e-04)	(1.83e-04)	(4.22e-03)	(5.30e-04)	(1.02e-04)
Model statistics						
N	57,928	57,928	23,770	74,132	74,132	40,475
Log-likelihood	61,386	61,386	47,536	119,386	119,386	94,434
χ^2	18,410***	1,296***	170***	20,605***	1,645***	144***

Note: $^+p < 0.10$; $^*p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$. Robust standard errors are in parentheses.

least squares (3SLS) estimation to estimate the exposure effect model. Recall that the exposure effect is defined as the post-promotion effect of mere coupon exposure (excluding the redemption effect) on post-promotion purchases, compared to the post-promotion purchase without receiving a coupon. Therefore, the estimation is on a subsample of customers who received a coupon but did not redeem the coupon and those who did not receive a coupon. We apply ordinary least-squares (OLS) to a subsample of customers who received a coupon to examine the redemption effect. Estimations for the Sticky coupon's post-promotion effect and that for the Urgent coupon's are conducted individually. Table 4 shows the estimation results. The estimation results for exposure effects of coupons on Sticky service and those on Urgent service are shown in Columns 1 and 2 and Columns 4 and 5, respectively. The estimation results for redemption effects of coupons on Sticky service and those on Urgent service are shown in Columns 3 and 6, respectively. Between estimation results for Sticky service and Urgent service, the estimates for most common variables are consistent in terms of sign and significance. Below, we discuss the results for the post-promotion effects on Sticky service in Columns 1–3, while the results for Urgent services are similar.

Column 1 shows the estimation results for Equation (1). The coefficient of $HIGH\_VALUE_{i0}$ is positive and significant ($\alpha = 0.69$, $p < 0.001$), meaning that the firm is more likely to issue high-value coupons. The coefficient of $FREQUENCY_{i0}$ is negative and significant ($\alpha = -0.03$, $p < 0.001$), indicating that the firm is more likely to drop coupons to customers who purchased less frequently. The coefficient of $MONETARY\_VALUE_{i0}$ is negative and significant ($\alpha = -9.13\text{e-}05$, $p < 0.001$), indicating customers are more likely to receive a coupon when they purchase in smaller monetary amounts. The positive and significant coefficient of $STICKY\_COUPON_{i0}$ ($\alpha = 4.17\text{e-}05$, $p < 0.001$) and the negative and significant coefficient of $URGENT\_COUPON_{i0}$ ($\alpha = -4.97\text{e-}05$, $p < 0.001$) indicates that the firm is more likely to issue a coupon on Sticky service when it issues more Sticky coupons or fewer Urgent coupons the day before.

Having considered the firm's coupon-dropping process, Column 2 shows the estimation results for Equation (2). The negative and significant coefficient of $DROPPING_{i0}$ ($\gamma = -0.03$, $p < 0.001$) indicates that customers tend to purchase less after they are exposed to but do not redeem a coupon as compared to those who do not receive a coupon. Hence, H1a is rejected, and H1b is supported. The control variables are significant with expected signs. The positive and significant coefficients of $HIGH\_VALUE_{i0}$ ($\gamma = 0.01$, $p < 0.001$), $FREQUENCY_{i(0,1)}$ ($\gamma = 0.01$, $p < 0.001$), and $MONETARY\_VALUE_{i(0,1)}$ ($\gamma =$ 8.49e-06, $p < 0.001$) show that customers tend to purchase more after a promotion if they purchase more often, purchase in larger amounts, or receive a coupon of higher face value before the coupon expires.

Column 3 displays the results for Equation (3). Comparing customers who redeemed a coupon and those who received but did not redeem a coupon, the positive and significant coefficient of $REDEMPTION_{i1}$ ($\delta = 0.02$, $p < 0.001$) indicates a positive redemption effect on customers' post-promotion purchases. Hence, H2 is supported. The control variables are significant with expected signs. The positive and significant coefficients of $HIGH\_VALUE_{i0}$ ($\delta =$ 1.00e-03, $p < 0.10$), $FREQUENCY_{i(0,1)}$ ($\delta =$ 1.89e-03, $p < 0.001$), and $MONETARY\_VALUE_{i(0,1)}$ ($\delta =$ 8.33e-07, $p < 0.001$) show that customers tend to purchase more after a promotion if they purchase more often, purchase in larger amounts, or receive a coupon of higher face value before the coupon expires.

We re-estimate Equations (1) to (3) using the same estimation approaches on customers' post-promotion purchase rate on other products that are not on promotion. Table 5 shows the spillover effects. The estimation results for spillover exposure effects of coupons on Sticky service and those on Urgent service are shown in Columns 1 and 2 and Columns 4 and 5, respectively. The estimation results for spillover redemption effects of coupons on Sticky service and those on Urgent service are shown in Columns 3 and 6, respectively. Between estimation results for Sticky service and Urgent service, the estimates for most common variables are consistent in terms of sign and significance. Below we discuss the results for the post-promotion effects on Sticky service in Columns 1–3.

Column 1 shows the firm's coupon-dropping decision. The coefficient of $HIGH\_VALUE_{i0}$ is positive and significant ($\beta = 0.70$, $p < 0.001$), meaning the firm is more likely to issue high-value coupons. The coefficient of $FREQUENCY_{i0}$ is negative and significant ($\beta =$ −8.22e-03, $p < 0.001$), indicating that the firm is more likely to drop coupons to customers who purchased less frequently. The coefficient of $MONETARY\_VALUE_{i0}$ is negative and significant ($\beta =$ −7.99e-05, $p < 0.001$), indicating customers are more likely to receive a coupon when they purchase in smaller monetary amounts. The negative and significant coefficient of $STICKY\_COUPON_{i0}$ ($\beta =$ −1.32e-04, $p < 0.001$) and the positive and significant coefficient of $URGENT\_COUPON_{i0}$ ($\beta =$ 1.12e-05, $p < 0.001$) indicate that the firm is more likely to issue a coupon on Sticky service when it issues less Sticky coupons or more Urgent coupons the day before.

Having considered the firm's coupon dropping process, Column 5 shows the estimation results for the spillover exposure effect. The negative and significant coefficient of $DROPPING_{i0}$ ($\rho = -8.17$, $p < 0.001$) indicates that customers tend to purchase fewer products that are not on promotion after they are exposed to but do not redeem a coupon as compared to those who do not receive a coupon. Hence, H4a is rejected, and H4b is supported. The control variables are significant with expected signs. The positive and significant coefficients of $HIGH\_VALUE_{i0}$ ($\rho = 5.66$, $p < 0.001$) and $FREQUENCY_{i(0,1)}$ ($\rho = 0.98$, $p < 0.001$) show that customers tend to purchase more nonpromoted products after promotion if they purchase more often or receive a coupon of higher face value before the coupon expires. The negative and significant coefficient of $MONETARY\_VALUE_{i(0,1)}$ ($\rho =$ −8.80e-06, $p < 0.001$) indicates that customers tend to purchase less nonpromoted products if they purchase in larger amounts before.

Column 3 displays the results for the spillover redemption effect. The positive and significant coefficient of $REDEMPTION_{i1}$ ($\theta = 0.30$, $p < 0.001$) indicates a positive spillover redemption effect on customers' post-promotion purchases by comparing customers who redeemed a coupon and those who received but did not redeem a coupon. H3 is supported. The control variables are significant with expected signs. The positive and significant coefficients of $HIGH\_VALUE_{i0}$($\theta = 0.03$, $p < 0.01$) and $FREQUENCY_{i(0,1)}$ ($\theta = 1.05$, $p < 0.001$) show that customers tend to purchase more after promotion if they purchase more often or receive a coupon of higher face value before the coupon expires. The coefficient of $MONETARY\_VALUE_{i(0,1)}$ is not significant ($\theta =$ 2.21e-04, $p > 0.1$), indicating customers' purchase amount has no significant effect on their purchase rate of nonpromoted products after the promotion.

4.2 | Additional analyses

Customers may respond to coupons differently due to their heterogeneous characteristics (Bawa & Shoemaker, 1989; Leclerc & Little, 1997). To explore the underlying mechanisms of the exposure and redemption effects, we conduct additional analyses on how pre-promotion purchase behaviors affect customers' responses to coupons after promotion. In particular, we include an interaction term between coupon drops and customers' pre-promotion purchase behaviors for the exposure effect and an interaction term between coupon redemption and customers' pre-promotion purchase behaviors for the redemption effect. Tables A and B in the Supporting Information show the estimation results of the interaction effects on the post-promotion Sticky service purchase and Urgent service purchase, respectively.

The coefficient of $DROPPING_{i0} \times FREQUENCY_{i0}$ is negative and significant ($\gamma =$ −6.25e-03, $p < 0.001$ in Column 2 of Table A; ($\gamma =$ −4.72e-03, $p < 0.001$ in Column 2

TABLE 5 Estimation results (spillover effect)

	Sticky service			Urgent service		
	(1) $DROPPING_0$	(2) $SPILLOVER\_PURCHASE_2$	(3) $SPILLOVER\_PURCHASE_2$	(4) $DROPPING_0$	(5) $SPILLOVER\_PURCHASE_2$	(6) $SPILLOVER\_PURCHASE_2$
$HIGH\_VALUE_0$	0.70***	5.66***	0.03*	0.58***	3.37***	0.03**
	(0.01)	(0.08)	(0.01)	(4.37e-03)	(0.04)	(0.01)
$FREQUENCY_0$	−8.22e-03***			−0.01***		
	(2.47e-03)			(2.39e-03)		
$MONETARY\_VALUE_0$	−7.99e-05***			−1.10e-04***		
	(5.87e-06)			(6.18e-06)		
$STICKY\_COUPON_0$	−1.32e-04***			−1.52e-06		
	(1.12e-05)			(8.47e-06)		
$URGENT\_COUPON_0$	1.12e-05***			−1.56e-05***		
	(2.95e-06)			(3.54e-06)		
$DROPPING_0$		−8.17***			−5.94***	
		(0.11)			(0.07)	
$REDEMPTION_1$			0.30***			0.33***
			(0.06)			(0.04)
$FREQUENCY_{(0,1)}$		0.98***	1.05***		0.90***	0.71***
		(0.01)	(0.13)		(0.01)	(0.08)
$MONETARY\_VALUE_{(0,1)}$		−8.80e-04***	2.21e-04		−8.06e-04***	1.11e-03***
		(2.76e-05)	(2.10e-04)		(2.42e-05)	(3.02e-04)
Intercept	0.34***	2.59***	0.03***	0.44***	2.63***	0.04***
	(3.66e-03)	(0.04)	(5.04e-03)	(3.81e-03)	(0.03)	(4.05e-03)
Model statistics						
N	57,928	57,928	23,770	74,132	74,132	40,475
Log-likelihood	−129,718	−129,719	−30,238.04	−162,990	−162,990	−45,332
χ^2	17,089***	18,392***	156***	18,124***	23,448***	278***

Note: $^{+}p < 0.10$; $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$. Robust standard errors are in parentheses.

of Table B), indicating that the negative exposure effect is exacerbated when customers purchase more often before promotion. The interaction effect between coupon drops and the pre-promotion purchase dollar amount is heterogeneous between services: The positive and significant coefficient of $DROPPING_{i0} \times MONETARY\_VALUE_{i0}$ show a small significant positive effect on purchasing Sticky service (γ = 2.18e-05, $p < 0.05$ in Column 4 of Table A) but no significant effect on purchasing Urgent service (γ = −4.81e-06, $p > 0.10$ in Column 4 of Table B). The results suggest that customers who purchase more often before the promotion have likely formed their reservation prices. When these customers observe coupon price promotions for a product, they may update their reservation prices with a lower value for the product and regard the discounted price as the fair price, and they will not buy the product when the price is back to normal after promotion (Lattin & Bucklin, 1989; Papatla & Krishnamurthi, 1996; Winer, 1986). However, the interaction effect between coupon drops and the pre-promotion purchase dollar amount is heterogeneous between services: Results show a small significant positive effect on purchasing Sticky service but no significant effect on purchasing Urgent service. Customers may develop deeper gratitude for a coupon when they purchase large amounts before a promotion.

The insignificant coefficients of $REDEMPTION_{i0} \times FREQUENCY_{i0}$ (δ = 2.88e-03, $p > 0.10$ in Column 5 of Table A; δ = −3.48e-05, $p > 0.10$ in Column 6 of Table A) and $REDEMPTION_{i1} \times MONETARY\_VALUE_{i0}$ (δ = 9.01e-04, $p > 0.10$ in Column 5 of Table B; δ = −2.07e-05, $p > 0.10$ in Column 6 of Table B) shows no significant interaction effect between coupon redemptions and customers' pre-promotion purchase behavior.

4.3 | Robustness checks

We conduct robustness checks using different time windows to calculate the post-promotion purchase rates. We estimate the exposure, redemption, and spillover effects on the post-promotion purchase rates in 3, 14, and 30 days after the coupon expired. Tables C and D in the Supporting

Information show the exposure effect on post-promotion Sticky service purchase and Urgent service purchase using different time windows, respectively. Results confirm negative and significant exposure effects (the coefficient of $DROPPING_{i0}$ $\gamma = -0.04$ and $p < 0.001$ in Column 2, $\gamma = -0.03$ and $p < 0.001$ in Column 4, $\gamma = -0.02$ and $p < 0.001$ in Column 6 in Table C; $\gamma = -0.0122$ and $p < 0.001$ in Column 2, $\gamma = -0.0119$ and $p < 0.001$ in Column 4, $\gamma = -0.0086$ and $p < 0.001$ in Column 6 in Table D). Tables E and F show the positive and significant redemption effect (the coefficients of $REDEMPTION_{i1}$ are all positive and significant) on post-promotion Sticky service purchase and Urgent service purchase using different time windows, respectively.

Tables G and H in the Supporting Information show the spillover exposure effect on post-promotion Sticky service purchase and Urgent service purchase using different time windows, respectively. Results confirm the negative spillover exposure effect (the coefficients of $DROPPING_{i0}$ are all negative and significant). Tables I and J show the spillover redemption effect on post-promotion Sticky service purchases and Urgent service purchases using different time windows, respectively. Results show that the redemption effect is positive and significant (the coefficients of $REDEMPTION_{i1}$ are all positive and significant).

The estimated redemption effect using OLS may be biased due to self-selection: The customers who choose to redeem may be systemically different from those who choose not. To allay the concerns, we perform propensity score matching (PSM) to examine the redemption effect. PSM compares outcomes using similarly treated and controlled observations based on their propensity scores and is widely used in the literature (e.g., Rosenbaum & Rubin, 1983). We use the nearest neighbor matching algorithm based on the variables measuring customer behavior before the coupon drop, $HIGH\_VALUE_{i0}$, $FREQUENCY_{i0}$, and $MONETARY\_VALUE_{i0}$, their squared terms, and their interaction terms to match the treated observations (i.e., customers who redeemed a coupon) with the controlled observations (i.e., customers who did not redeem a coupon after receiving one) with the closest propensity scores (Hong & Pavlou, 2014). Table K displays the difference in the means of the matched variables before and after matching. After matching, the means of matched variables between the control group and treated group are not significantly different at a 5% significance level, demonstrating that the control group and treatment group are not significantly different along the matched dimensions. We use the matched sample to estimate Equation (3). Estimations for the Sticky coupon's post-promotion effect and that for the Urgent coupon's are conducted individually. Table L shows the estimation results. The estimation results for redemption effects of coupons on Sticky service and those on Urgent service are shown in Columns 1 and 3, respectively. Columns 2 and 3 in Table L show spillover redemption effects of the Sticky coupon and Urgent coupon, respectively. The results show that redemption and spillover redemption effects are positive and significant (the coefficient estimates of $REDEMPTION_{i1}$ are all positive and significant) and that the magnitudes of the estimated redemption and spillover redemption effects are also close to those in the main analyses (as shown in Tables 4 and 5).

5 | CONCLUDING REMARKS

Along with the rapid development of electronic commerce, electronic coupons have been increasingly used to replace print coupons. Our study is among the initial efforts to study the post-promotion effects of electronic coupons, including the exposure effect, redemption effect, and spillover effect. The literature on the post-promotion effect in terms of exposure and redemption effects is mixed in part due to the different data and methods used for estimation. Our study extends these prior studies by taking up the methodological challenges by separating the exposure effect and the redemption effect.

Surprisingly, counter to many prior studies (e.g., Bawa & Shoemaker, 1989; Leclerc & Little, 1997; Srinivasan et al., 1995; Venkatesan & Farris, 2012), we find that exposure to coupons is detrimental to customer purchases after coupon promotions end. There is a tradeoff between more information about the products and firms and lowered customer reservation and reference prices due to coupon exposure. Our findings show that the latter effect outweighs the former. That is, when customers observe coupon promotions, they may lower their perceived firm, brand, and product quality, thereby lowering their reservation and reference prices for the promoted product. As a result, they think that the coupon discounted price is the fair price, and they will not buy the product if the price is higher than the coupon discounted price. Our findings support a number of studies in the literature that also find similar negative exposure effects (e.g., Cox & Cox, 2002; Lattin & Bucklin, 1989). Our results are different from those that find a positive exposure effect (e.g., Bawa & Shoemaker, 1989; Srinivasan et al., 1995; Venkatesan & Farris, 2012), possibly due to the different research contexts. Different from the studies on the consumer packaged goods market where many brands compete by frequent price promotions, our empirical context features a dominating classified ads website where offered services cannot be stockpiled. Additionally, customers can post their ads for free. The paid services enhance the ad positions on a website. Coupon promotions might do more harm than good by lowering customers' reservation prices and quality perceptions.

Not surprisingly, we find a positive redemption effect on purchase rates. The redemption effect is incremental from the exposure effect, above and beyond the exposure effect. When customers redeem the coupons and gain direct experience from buying and using the products, the experience helps decrease their perceptions of uncertainty and risk associated with the firm and products, and in turn, offsets the negative impact of the exposure effect. As a result, after the coupon promotions end, the customer may have a greater chance to

purchase even if the prices are increased to the normal prices. This finding complements the studies that find a similar positive effect of redemption effect after promotion (e.g., Bawa & Shoemaker, 1989; Venkatesan & Farris, 2012).

It is worth noting the prevalence of the spillover effect for both redemption and exposure effects. The finding suggests that customer perception or experience can be carried over to other relevant products within the firm. When they perceive the quality of a product is lower, they will also lower their willingness to pay for other products; and when they gain a positive purchase experience from buying a product, they will increase their willingness to pay for other products as well. These findings are consistent with those in the literature where they find that customer experience in one product serves as a mechanism for reducing uncertainty in other products under umbrella brands (e.g., Erdem & Sun, 2002).

Further investigations show heterogenous exposure effects and spillover effects on customers with different purchase patterns. We find that the negative exposure effect is exacerbated when customers purchase more often. Customers who purchase more often may have formed the purchasing habit and may purchase a service regardless of the service's promotion status. Receiving a coupon, therefore, reduces these customers' reservation and reference prices and signals a lower product quality.

Our findings have important managerial implications for managers. First, electronic coupons are inexpensive to send to customers. Given the low cost, the conventional wisdom for firms is to send as many electronic coupons as possible. However, as we find, sending blanketed coupons is counterproductive. Firms may see some immediate sales bumps during the coupon promotions, but they will pay after the coupon promotions end as our findings show that, in the long term, exposure to coupons may hurt brand loyalty, thereby reducing customer purchases. Therefore, when firms design their electronic coupon marketing strategies, they should focus on identifying the targeted customers who have a high likelihood to redeem the coupons rather than sending the coupons to as many customers as possible. Customers who redeem the coupons will continue to purchase and purchase more. Second, when designing coupon promotion campaigns, managers should have a broader, holistic view by looking at all product offerings rather than looking at a single product. As we show, there are significant spillover effects from one product to other products within the firm. When they conduct a successful marketing promotion for one product, the whole product lines benefit. But when it is a less thought-out promotion, the failure is not only on one product but also on the whole product line.

Our study has several limitations that may be considered in future research. First, our data were collected from an online classified ad website. The coupon promotions are for the services that are "perishable" (the services have a short life cycle and cannot be stockpiled). Although this is an advantage for us to isolate the causal effect because the future demand is less impacted, our results should be generalized to other types of products and services with caution. Future research may extend our studies to the products that last longer on the shelf and test if our findings hold. Second, literature has shown that customer characteristics are important factors in determining their redemption and repurchase intents, for example, loyal customers and new customers. Unfortunately, we do not observe customer characteristics. Future research may expand our study to examine customer characteristics. Third, we propose several mechanisms that may result in a negative exposure effect and a positive redemption effect but could not directly identify a single mechanism that drives the result due to data limitation. Future research may collect primary data to measure customers' reference price or their perception of the focal firms' service quality after promotion to evaluate the weight of each factor.

ENDNOTES

[1] The short-term effect refers to the redemption purchases using the coupons, whereas the long-term effect refers to the purchases after the coupon campaign is ended. Furthermore, the exposure effect is the impact resulting from coupon drops, and the redemption effect is the impact from coupon redemptions above and beyond the exposure effect.

[2] RMB is the Chinese currency. $1 = RMB 6.9 at the time when our data were collected.

[3] We also collected the purchase data during the 3 days when the coupons were in effect but did not use them in our analyses as our goal is to study the post-promotion effects.

[4] $FREQUENCY$ and $MONETARY\_VALUE$ are 0s for consumers who had no transactions.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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