

## Social Group Buying as a Marketing Strategy

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### Abstract

*Social group buying (SGB) is a novel form of group buying that encourages customers to purchase deeply discounted products together with friends. Over the past few years, SGB has become a popular marketing strategy for online sellers to acquire new customers. Using a dataset from an e-commerce platform, we investigate whether and how SGB affects the sales of sellers. We find that enrolling a few products into SGB has a positive spillover effect on the sales of the sellers' other products, and the effect varies substantially across different types of sellers. Specifically, the positive spillover effect is larger for smaller sellers and more diversified sellers. Moreover, we find that the spillover effect exhibits similar heterogeneity at the brand level, except that it can be negative for large brands and non-diversified brands. This finding suggests that sellers may gain from SGB at the expense of large brands.*

**Keywords:** social shopping, group buying, spillover effect, seller, brand

### 1. Introduction

Group buying is a marketing campaign that offers products with deep discounts if a minimum number of customers commits to purchase. Originally, group buying campaigns are launched and promoted by intermediary platforms such as Groupon and LivingSocial, and usually require hundreds or thousands of customers to join to secure the deal. However, this form of group buying has gradually gone out of fashion due to a series of flaws with the business model.<sup>1</sup>

Recently, group buying has evolved into a form of social shopping that allows customers to purchase discounted products together with friends, which is also known as social group buying (SGB). While shopping for products supporting SGB, customers can

click on a group buying button to generate an encrypted link and share the link with others. If the number of customers using this link to purchase the product meets the threshold set by the seller (typically less than 5), they will get the product at the discounted price. SGB turns out to be a particularly successful marketing strategy. For example, Pinduoduo, the pioneer of SGB, attracted 585 million active users and become the second-largest Chinese e-commerce platform in just four years (Hariharan & Dardenne, 2022). The success of SGB lies in the fact that it emphasizes social interactions in shopping. Social interactions have proved to be positively associated with users' purchase intention because they can fulfill consumers' needs for feedback while shopping (Gunawan & Huarng, 2015; Wang & Yu, 2017). In addition, promotions made by consumers can be more effective than the traditional promotion, because people are more likely to trust the information provided by other shoppers like themselves.

While SGB allows the sellers to acquire new customers, the promotion may cannibalize the sales of unpromoted products and may even lead customers to question the quality of their products, because customers tend to associate price discounts with low quality (Biswas et al., 2013; Chen & Kirmani, 2015). Therefore, participating in SGB can be a double-edged sword for sellers and whether it is beneficial to sellers does not have a straightforward answer. So far, the extant literature on group buying has studied how participating in group buying affects the reputation of sellers (Byers et al., 2012; Li, 2016), the sales of group buying coupons (Bai et al., 2015), and the profitability of sellers in analytical models (Edelman et al., 2014; Marinesi et al., 2017). However, there is no empirical research on how enrolling into SGB affects the sales of sellers yet.

Since sellers typically only offer SGB for a very small subset of their products during a very short period, the impact of SGB on the sales of sellers primarily depends on its spillover effect on other products of the sellers. The spillover effect of SGB may vary across sellers with different characteristics. For example, small sellers with low visibility on the

<sup>1</sup> <https://knowledge.wharton.upenn.edu/article/death-daily-deal/#:~:text=The%20study%20found%20that%202021.7,run%20another%20daily%20deal%20promotion.>

platform may benefit more from the advertising effect of group buying (Edelman et al., 2014) than large sellers. Moreover, the spillover effect may be small or even negative for non-diversified sellers that only sell products in one category because of the demand cannibalization. Therefore, we aim to answer the following questions in this paper:

1) Whether participating in SGB has a spillover effect on the sales of the sellers' other products?

2) Whether the spillover effect varies across large and small sellers?

3) Whether the spillover effect varies with the diversity of sellers' products?

To answer these questions, we obtain a proprietary dataset from a large e-commerce platform in China. This platform initially did not offer SGB but launched this feature in September 2019. The staggered adoption of this feature by sellers allows us to investigate the spillover effect of SGB on sellers' other products in a difference-in-differences (DID) setting. In addition to analyzing the spillover effect at the store level, we also analyze the spillover effect at the brand level.

Our empirical analysis establishes four findings. First, participating in SGB has a positive spillover effect on the sales of other products offered by the sellers, which confirms the advertising effect of SGB. Second, participating in SGB has a larger positive spillover effect on small sellers than on large sellers. Third, participating in SGB has a larger positive spillover effect on diversified sellers than on non-diversified sellers, likely because non-diversified sellers are more likely to suffer from the cannibalization effect. Finally, at the brand level, the spillover effect also decreases with brand size and increases with brand diversity, but it can be negative for large brands and non-diversified brands.

Our work makes the following contributions to the literature. First, prior studies on the effectiveness of group buying as a marketing strategy predominantly rely on analytical models (Edelman et al., 2014; Marinesi et al., 2017), we add to the literature by empirically investigating how promoting a subset of products via group buying affects the sales of other products offered by the sellers. Second, while prior empirical studies have investigated the impact of group buying on the reputation of sellers (Byers et al., 2012; Li, 2016) and the revenue from group buying coupons (Bai et al., 2015), how group buying affects the sales of sellers—a question of greater importance to sellers—remains unclear. Our paper fills this gap by documenting the positive spillover effect of group buying on unpromoted products of sellers. Third, our study provides novel insights on how different types of sellers may benefit from group buying differently, which has important implications for both the sellers

and the platforms. Finally, our study also sheds light on the overlooked impact of group buying on brands.

## 2. Literature Review

The literature on group buying can be divided into two streams. One stream focuses on the consumers behaviors in group buying, such as what motivates consumers to use group buying and what affects consumers' purchase intentions. According to Chen (2012), profit, value, emotion, and achievement are the four motivations for consumers to use group buying. In addition, the use of group buying can also be affected by consumer trust and consumer reciprocity (Shiau & Luo, 2012; Liu et al., 2013). Furthermore, previous studies have shown that consumers' purchase intention can be influenced by factors including the previous number of buyers, purchase limit (Coulter & Roggeveen, 2012), online WOM (Cheng & Huang, 2013; Ku, 2012; Li & Wu, 2013), and service quality (Ku, 2012; Zhang et al., 2013).

The other stream focuses on merchants' adoptions of group buying. Most of research in this stream investigates the profitability and optimal design of group buying using analytical models. For example, Jing and Xie (2011) find that group buying outperforms individual selling strategy and referral rewards programs. Edelman et al. (2016) show that offering group buying is more beneficial for sellers with low marginal costs. Hu et al. (2020) show that a preset threshold and a flexible duration are critical to the success of a group buying campaign. Moreover, Hu et al. (2013) find that the sequential mechanism leads to more group buying success and consumer surpluses than the simultaneous mechanism in a two-period game-theoretical model.

A few empirical studies have also examined the impact of group buying on merchants. Using data from Groupon and Yelp, Byers et al. (2012) find that offering group buying decreases the sellers' reputation. However, Li (2016) shows that this effect is positive for retailers with lower ratings. Bai et al. (2015) show the presence of minimum requirement deals increases Facebook likes, the number of coupons sold, and the revenue from coupons. Wu et al. (2014) investigate customers' behavior on Groupon and find that there is a surge in new sign-ups around the time when the threshold is reached. While these studies provide valuable insights on the impact of group buying, how group buying affects the sales of sellers' other products—a crucial question facing sellers—has not been studied yet.

### 3. Hypothesis Development

In this section, we discuss several mechanisms through which SGB may influence the sales of the sellers' other products, as well as how the strengths of these mechanisms may vary across different types of sellers.

#### 3.1. Spillover Effect of SGB

*Advertising Effect.* The primary reason for sellers to participate in SGB is that they may benefit from an advertising effect (Edelman et al., 2016). The advertising effect can be manifested in the form of increased traffic or increased awareness. SGB can increase the traffic of sellers because the price discounts can attract more customers to visit the online stores of sellers. Moreover, for customers who eventually decide to purchase the products promoted in SGB, they need to invite a minimum number of others to join them to receive the discounts. The increased traffic may lead to a positive spillover effect on other products of the sellers. Once visited a store, rather than only purchasing the promoted items, customers usually also spend substantial amounts of time on non-promoted products (Dickson & Sawyer, 1990; Mulhern & Leone, 1991).

In addition to the increasing traffic, participating in SGB may also increase the exposure of sellers and hence increase their awareness among customers. While the awareness of a seller does not directly translate into a purchase intention, it can positively affect customers' perceived trustworthiness and risk of the seller (Dutta & Bhat, 2016), which then leads to a positive impression of the seller and an intention to engage in purchase activities (Gurung et al., 2014). Therefore, the increased awareness is also beneficial to the sales of other products of the sellers.

*Cannibalization Effect.* A seller often sells a large set of products and some of them may be substitutes of each other. While SGB increases the sales of the promoted products, it may cannibalize the sales of unpromoted substitutes offered by the seller. Prior studies have shown that promotions may lead to cannibalization (Dawes, 2012). The cannibalization effect could lead to a negative spillover effect on the sales of other products of the sellers.

*Negative Perception Effect.* Participating in SGB may hurt the image of sellers because customers tend to associate price discounts with low quality (Biswas et al., 2013; Chen & Kirmani, 2015). When the discount depth is high, as is often the case in SGB, customers are more likely to attribute the price discount to quality-related factors (Zheng et al., 2021). As such, SGB may cause customers to question the quality of all

the products offered by the sellers, which can also lead to a negative spillover effect on the sales of other products of the sellers.

Considering these mechanisms with mixed effects on the sales of the other products offered by the sellers, we posit the following two competing hypotheses regarding the spillover effect of offering SGB on the sales of sellers' other products.

*H1a: Offering SGB has a positive spillover effect on the sales of sellers' other products.*

*H1b: Offering SGB has a negative spillover effect on the sales of sellers' other products.*

#### 3.2. Heterogeneous Spillover Effects on Large and Small Sellers

The spillover effect of offering SGB may vary across different types of sellers because two mechanisms contributing to the spillover effect (i.e., the advertising effect and the quality perception effect) may vary across large and small sellers. For small sellers with low visibility on the platform, offering SGB may substantially increase their traffic and awareness on the platform. On the contrary, for large sellers that are already well-known among the customers, the incremental traffic and awareness can be relatively small compared to their original traffic and awareness. Consequently, the advertising effect of SGB can be stronger for small sellers than for large sellers.

The negative perception effect may also depend on the size of the seller. For large sellers with a well-established reputation, customers tend to perceive the discounts of SGB simply as a marketing strategy rather than a negative indication of their product quality. However, for small sellers that are not well-known among customers, offering discounted products may leave customers an impression that the products offered by the sellers are of low quality. Worse still, customers may believe that the sellers are not successful because of poor product quality. Therefore, the negative perception effect may be stronger for small sellers than for large sellers.

The heterogeneity in the advertising effect suggests a stronger positive spillover effect for smaller sellers, whereas the heterogeneity in the negative perception effect indicates a stronger negative spillover effect for smaller sellers. Thus, we make the following two competing hypotheses:

*H2a: Offering SGB has a larger spillover effect on small sellers than on large sellers.*

*H2b: Offering SGB has a smaller spillover effect on small sellers than on large sellers.*

### 3.3. Heterogeneous Spillover Effects on Diversified and Non-Diversified Sellers

The spillover effect of SGB may also depend on the diversity of sellers' product lines because both the advertising effect and the cannibalization effect tend to vary across sellers with different levels of diversity. For sellers with a highly diversified product line, the incremental traffic and awareness may lead customers to explore additional products they would otherwise not pay attention to, which suggests that these sellers may benefit more from the advertising effect than sellers focusing on products in one category. Meanwhile, more diversified sellers are less likely to suffer from the cannibalization effect because their products are less likely to be substitutes of each other. The heterogeneity in both the advertising effect and cannibalization effect suggests that the spillover effect is larger for more diversified sellers, which leads to the following hypothesis.

*H3: Offering SGB has a larger spillover effect on more diversified sellers.*

## 4. Data

### 4.1. Research Context

Our research context is a leading Chinese e-commerce platform that focuses on healthcare products. Hundreds of stores on this platform offer a wide range of products, such as over-the-counter drugs, prescription drugs, medical appliances, dietary supplements, beauty products and cosmetics, and baby products. In September 2019, the platform started to offer the SGB feature to sellers (stores) and customers. To participate in SGB, the stores need to select one or multiple products to enroll into SGB, specify the SGB price, and set the minimum group size. The SGB price is usually less than half of the normal price, and the minimum group size is typically two.

To help customers find the products eligible for SGB, the platform offers a portal to access all SGB products at a salient location on the front page. After clicking into an SGB product, customers can view detailed information about the product, such as the SGB price, the normal price, the product description, the brand of the product, and the store's information. To purchase the product, customers can either initiate a group order on their own or join others who have already submitted a group order. They need to pay the SGB price when they initiate or join a group order. If the number of customers in the group order meets the

minimum group size within a pre-specified time window (e.g. 24 hours), all group members will get the product at the discounted price. Otherwise, the group order will be canceled and the payment will be refunded to the customers.

### 4.2. Variables

We obtain the transaction data of all 389 stores on this platform from January 2019 to January 2021. Since SGB was introduced in September 2019, we focus on the 186 stores created before September 2019. Because we are interested in the spillover effect of SGB, we removed all SGB orders from our data. We aggregate the sales of each store month by month, resulting in an unbalanced panel dataset with 4,836 observations.

*Dependent Variable.* Our dependent variable is the monthly sales of a store (i.e., the number of products sold by the store each month), excluding group buy orders. The distribution of the monthly sales is highly right-skewed. Therefore, we log transform it to reduce the excessive influence of outliers.

*Focal Variable.* We create a dummy variable *treated* to indicate whether a store has ever offered SGB by a given month. This is a time-varying variable but remains zero for stores that never participate in SGB.

*Moderating Variables.* We investigate the impacts of two moderators on the spillover effect of offering SGB. The first moderator is the store size (*size*). We use the cumulative number of products sold before September 2019 as a continuous measure of store size. The second moderator is whether a store is a diversified store (*diversified*). We regard a store as diversified if a store sells products in more than one product category. Both moderators are time-invariant. Table 1 summarizes the definitions of the variables used in this study.

## 5. Empirical Results

### 5.1. Empirical Model

We use the difference in difference (DID) method to estimate the spillover effects of SGB on the sales of the stores' other products. Since different stores participate in SGB at different time points, we use a staggered DID model as follows:

$$\log(sales_{it}) = \beta_1 treated_{it} + u_i + v_t + \epsilon_{it} \quad (1)$$

**Table 1. Variable Definition and Summary Statistics**

	Description	Mean	SD	Min	Median	Max
sales	The monthly number of orders of a store	2557.00	19623.51	0	54	428254
treated	Dummy variable. Equals 1 if a store has already used SGB by the given month	0.05	0.23	0	0	1
size	The cumulative number of orders of a store before September 2019	17444.26	122145.2	1	715.5	1234291
diversified	Dummy variable. Equals 1 if a store sells more than one category of products	0.80	0.40	0	0	1

Here, the dependent variable  $\log(sales_{it})$  is the log-transformed sales of store  $i$  in month  $t$ , excluding group buy orders. The dummy variable  $treated_{it}$  equals 1 if a store has already participated in SGB by month  $t$ , and otherwise 0.  $u_i$  is the store-level fixed effect, and  $v_t$  is the time-level fixed effect. With the time-level fixed effects, we allow the average sales of stores to vary arbitrarily month by month. We report robust standard errors clustered by stores. In doing so, we allow the error terms on the same store to be arbitrarily correlated, including serially correlated.  $\beta_1$  in the above equation captures the spillover effect of offering SGB on the sales of a store's other products.

It should be noted that this DID specification with user-level fixed effects allows stores to self-select to participate in SGB based on time-invariant characteristics at the store level. We estimate the moderating effects of store size and diversity by interacting them with the treatment dummy in the model given by Equation (2).

$$\log(sales_{it}) = \beta_1 treated_{it} + \beta_2 treated_{it} \times \log(size_i) + \beta_3 treated_{it} \times diversified_i + u_i + v_t + \epsilon_{it} \quad (2)$$

### 5.2. Store Level Analysis

Table 2 reports the results of our DID model under various specifications. In Column 1, the coefficient of *treated* is positive and significant, lending support to H1a that offering SGB has a positive spillover effect on the sales of unpromoted products in the stores. This finding suggests that the advertising effect dominates the potential cannibalization effect and negative perception effect. This finding shows that SGB is an effective marketing strategy in increasing the sales of stores. Next, we examine how the effectiveness of this marketing strategy varies across different types of stores.

**Table 2. The Spillover Effect of SGB on the Sales of Stores**

	Dependent variable: log(sales)			
	(1)	(2)	(3)	(4)
treated	1.327*** (0.368)	2.305*** (0.748)	1.530*** (0.419)	3.631*** (0.910)
treated × log(size)		-0.136** (0.061)		-0.263*** (0.076)
treated × diversified			1.016** (0.501)	2.021*** (0.632)
Store FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
Observations	4,836	4,836	4,836	4,836
R-Squared	0.69	0.69	0.69	0.691

Notes: Robust standard errors clustered by lives in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

*Moderating effect of store size.* In Columns 2 and 4, the interaction term between *treated* and *log(size)* is negative and significant, which lends support to H2a instead of H2b. This result is consistent with our argument that the advertising effect of SGB is weaker for large stores with high visibility on the platform than for small stores with low visibility. It is possible that participating in SGB also leads customers to be more skeptical about small stores' product quality, but the impact is outsized by the larger advertising effect for small stores. Our finding suggests that SGB is an attractive marketing strategy for small stores that often lack the budget to purchase ad slots on e-commerce platforms.

*Moderating effect of store diversity.* The coefficient of the interaction between *treated* and *diversified* in Columns 3 and 4 is positive and significant, indicating that offering SGB has a larger positive spillover effect on diversified stores than on non-diversified stores. This result lends support to H3 and can be well explained by the differential cannibalization effects for diversified and non-diversified stores. The cannibalization effect is stronger for non-diversified stores because their products are more likely to be competitors of each than diversified stores.

## 6. Additional Analysis

### 6.1. Brand Level Analysis

In addition to the store level analysis, we also conduct a similar analysis at the brand level because the spillover effect may also apply to brands. Although the decision of whether to participate in

SGB is made by stores rather than brands, brands could be affected if their products are enrolled into SGB by stores. When one product of a brand is prompted via SGB, other products of the brands may also be influenced by the advertising effect, cannibalization effect, and the negative perception effect. Therefore, the spillover effect may have similar patterns at the store level and the brand level.

To estimate the spillover effect of offering SGB on other products of brands, we aggregate the sales of 7,416 brands month by month, resulting in an unbalanced panel dataset with 191,528 observations. We use the same models given by Equations (1) and (2) for this analysis. The only notable difference is that *treated<sub>it</sub>* now indicates whether brand *i* has any product involved in SGB by month *t*. Table 3 summarizes the results.

The coefficient of *treated* in Column 1 of Table 3 is positive and significant, indicating that SGB has a positive overall spillover effect on other products of brands. This finding suggests that the advertising effect dominates the potential cannibalization effect and negative perception effect even at the brand level. The negative and significant coefficient of the interaction between *treated* and *log(size)* in Columns 2 and 4 suggest that the positive spillover effect is weaker for larger brands. The positive and significant coefficients of the interaction between *treated* and *diversified* in Columns 3 and 4 indicate that SGB has a larger positive spillover effect on diversified brands. However, this effect is not significant at the brand level because majority of the brands are not diversified: only 3.2% of the brands are diversified brands. Overall, these findings are highly consistent with those from the store level analysis.

**Table 3. The Spillover Effect of SGB on the Sales of Brands**

	Dependent variable: log(sales)			
	(1)	(2)	(3)	(4)
<i>treated</i>	0.328*	0.984*	0.158	0.995***
	(0.190)	(0.525)	(0.301)	(0.478)
<i>treated</i> × <i>log(size)</i>		-0.101*		-0.148***
		(0.061)		(0.053)
<i>treated</i> × <i>diversified</i>			0.330	0.572
			(0.359)	(0.361)
Store FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
Observations	191,528	191,528	191,528	191,528
R-Squared	0.806	0.806	0.806	0.806

Notes: Robust standard errors clustered by lives in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Despite the similarities in the directions of the main and moderating effects of the spillover effects at the brand and store level, there is a noticeable difference in their effect sizes. Specifically, the brand level spillover effect is much smaller than that at the store level and can even be negative for certain brands. For example, Column 2 shows that the spillover effect can be negative for 27 brands with over 17,072 cumulative orders. In contrast, the large main effect of *treated* in Table 2 ensures that the store level spillover effect is positive for all stores on the platform. This finding suggests that stores may benefit from SGB at the expense of large brands.

## 6.2. Impact of Promotion Strategies

In this subsection, we investigate whether and how the spillover effect of SGB varies with the promotion strategy. We consider three dimensions of a promotion strategy: breadth, depth, and duration. Promotion breadth refers to the scope of the product used for a promotion, and promotion depth refers to the magnitude of a product discount (Gauri et al. 2017; Glauben et al., 2011). Promotion duration represents how long an SGB promotion is offered. In this analysis, we define a store's promotion breadth as its number of products eligible for SGB, promotion depth as its

average percentage discount of SGB products, and promotion duration as the number of months it has offered SGB.

Table 4 summarizes the moderating effects of different types of promotion strategies. The results show that the spillover effect on stores is stronger when the SGB promotion involves more products and when the promotion lasts longer. However, the interaction between *treated* and *promotion\_depth* is negative and insignificant, indicating that stores do not benefit from aggressive price discounts. A potential reason is that the negative perception effect is stronger when the price discount is larger.

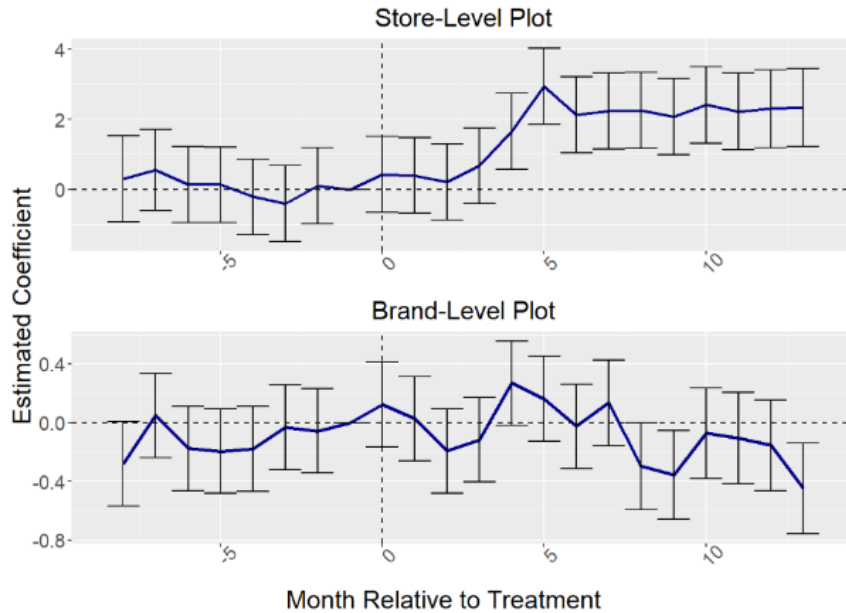
## 6.3. Parallel Trend Assumption

Since we have a staggered DID design, we include the leads and lags of *treated<sub>it</sub>* in our DID model to test whether the treated and untreated units are comparable before the treatment (Autor, 2003). The top (bottom) panel in Figure 1 visualizes the coefficients of the leads and lags in our store (brand) level DID model. In either model, none of the coefficients for the leads is significantly different from zero, indicating that the parallel trend assumption holds in the pre-treatment period.

**Table 4. Moderating Effects of Promotion Strategies**

	Dependent Variable: log(sales)		
	(1)	(2)	(3)
<i>treated</i>	0.256 (0.539)	1.443* (0.469)	-1.384* (0.789)
<i>treated</i> × log( <i>promotion_breadth</i> )	0.699** (0.285)		
<i>treated</i> × log( <i>promotion_depth</i> )		-0.234 (0.721)	
<i>treated</i> × log( <i>promotion_duration</i> )			1.209*** (0.404)
Store FE	Yes	Yes	Yes
Month FE	Yes	Yes	Yes
Observations	4,836	4,836	4,836
R-Squared	0.690	0.691	0.691

Notes: Robust standard errors clustered by lives in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .



**Figure 1. Parallel Trend Test**

## 7. Conclusions

SGB has shown to be an effective strategy for e-commerce platforms to acquire new customers. However, whether and how sellers benefit from this marketing strategy is not well understood yet. Leveraging a rich dataset from an e-commerce platform, we investigate how enrolling a few products into SGB affects the sales of other products offered by the seller. We document several important findings: 1) SGB has a positive spillover effect on a seller's other products, 2) the spillover effect is larger for small sellers with low visibility on the platform than for large sellers, 3) the spillover effect is stronger on diversified sellers than on non-diversified ones, 4) at the brand level, the overall spillover effect and the heterogeneity with respect to size and diversity are similar with those observed at the seller level, but the brand level spillover effect can be negative for large brands.

Our findings have important implications for sellers and brands. First, small sellers should be more proactive in using group buying to advertise themselves on e-commerce platforms, because they benefit more from group buying than large sellers. Group buying can be particularly useful for sellers who do not have enough budget for other forms of marketing campaigns. Second, for non-diversified

sellers, the benefit of group buying may be lower than expected due to the strong cannibalization effect between promoted and unpromoted products. Third, large brands should pay close attention to group buying campaigns on their products, because they could have a negative spillover effect on their other products. A potential way for these brands to protect themselves is to include terms on group buying when negotiating supply contracts with sellers. Finally, our analysis suggests that sellers participating in group buying should focus on the breadth and duration of their promotions, rather than the depth of their promotions.

Our study has its limitations. As is common in DID analysis, we can only test the parallel trend assumption in the pre-treatment period, but not in the post-treatment period. If sellers self-select to participate in group buying based on unobserved time-varying factors, the parallel trend may not hold in the post-treatment period. However, this potential seller-level self-selection cannot explain our consistent findings at the brand level, since brands do not self-select to participate in group buying. In addition, our findings are from only one e-commerce platform focusing on healthcare products. However, since the theoretical arguments for our findings are not specific to healthcare products, there are no compelling reasons to believe that our findings are not generalizable to other e-commerce platforms



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