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# Social Group Buying Strategy Considering Group Leader Incentives

Yan Wang[1], Huan Liu[2*], Donghui Yang[3]

[1]*Business School, Nanjing University of Science and Technology Zijin College, Nanjing, China; Email: wangyan_njustzj@163.com*
[2]*Business School, Nanjing University of Science and Technology Zijin College, Nanjing, China; Email: liuhuan8778@126.com*
[3]*School of Economics and Management, Southeast University, Nanjing, China; Email: dhyang@seu.edu.cn*

***Corresponding Author:** liuhuan8778@126.com

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## ABSTRACT

With the proliferation of social group buying, leader incentives have become a common yet strategically complex platform tool. Their effectiveness is highly context dependent and requires careful market-specific evaluation. This study develops game-theoretic models to analyze monopolistic and competitive markets by examining how social tie strength, leader incentives, group size, and pricing interact. Leader incentives increase profits only when strong user-leader social ties exist. In competitive settings, they are the most effective against smaller rivals with low cross-price sensitivity. This research provides actionable guidance for platforms to optimize incentive strategies on the basis of social relationship strength and a competitive landscape, enhancing strategic decision-making in social commerce.

**Keywords:** Social Group Buying, Group Leader Incentives, Monopoly, Competition

## INTRODUCTION

Group buying, also known as collective purchasing, refers to a shopping method in which consumers—whether acquainted or not—join forces to strengthen their bargaining power with manufacturers and secure the best possible price. With the rapid development of social media, information dissemination among individuals has become increasingly convenient, making online groups buy a common marketing strategy on social e-commerce platforms (Wang, 2023). Prominent examples in China include platforms such as Pinduoduo and Meituan, whereas major e-commerce players such as Taobao and JD.com have launched their own group-buying channels.

Social e-commerce group buying typically involves an initiator known as the "group leader." This leader discovers group purchase product information through personal browsing or big-data recommendations. If they are satisfied with the group price, they generate a personalized group purchase link and share it on social media platforms, such as WeChat Moments, group chats, or directly with friends and family. Interested consumers can then join group purchases to enjoy the discount price. For example, in Pinduoduo, group purchase prices are significantly lower than individual purchase prices. To benefit from the group discount, consumers must share product information on WeChat groups or social media after payment. Other buyers of interest can join via shared links. Once the required number of participants is reached, the group purchases succeed, and the manufacturer proceeds with shipping.

The group-buying mechanism in social commerce, which relies on consumer relationships, is a marketing strategy rooted in social media and user networks (Wang, 2024). This model typically involves organizing and executing group purchases through social e-commerce platforms, driving sales through user interactions and sharing. The first participant in the group purchase becomes the group leader, a pivotal role that directly influences the success rate and scale of group purchases. Group leaders are usually registered users of the platform who maintain interest in the platform's recommended group purchase offers over time and initiate group purchases when they encounter desirable products.

The group-buying process is illustrated in Figure 1. After joining a group purchase, the leader shares a participation link with others, either individuals or communities. Consumers with purchasing needs then join the group. Once the predetermined group size is reached, the group purchase is successful, and the platform relays the order to the supplier for fulfillment. Social group buying allows the platform to leverage the leader's sharing to amplify demand exponentially. The high-volume, low-margin model benefits multiple stakeholders, including suppliers, platforms, group leaders, and consumers.

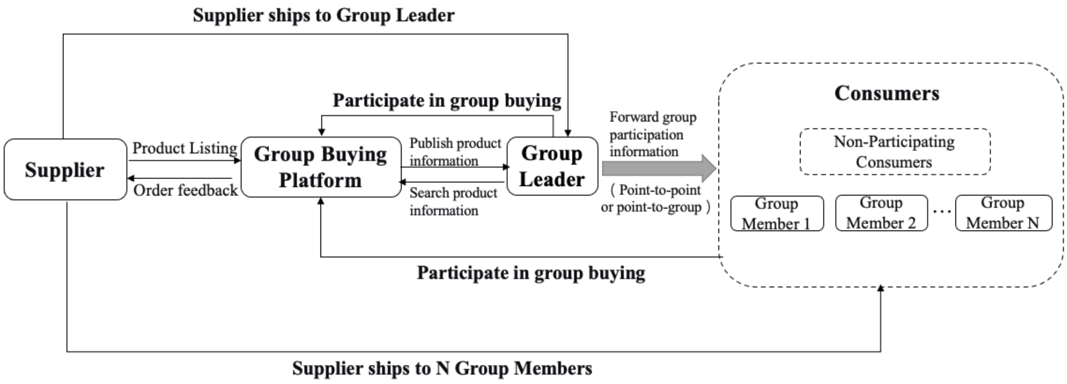



**Figure 1.** General process of social group buying.

One of the primary reasons that users may be attracted to participating in group buying activities is to obtain price discounts or exclusive offers. This advantage can stimulate purchasing desires, making users feel that they have gained tangible economic benefits. Users may realize that, through group buying, they can collectively form purchasing power to secure better prices and deal terms. Therefore, merchants or platforms must fully consider this factor when setting group buying prices to effectively stimulate users' purchasing enthusiasm.

In online group buying, the group leader must persuade multiple people to join the group to secure the group price, whereas other participants can enjoy the group price without additional effort. To encourage leaders to invest more effort in organizing groups, merchants or platforms may increase leader benefits by offering various forms of incentives, such as cash rebates, prizes, or coupons, in addition to the group price. However, such incentives may prompt some users who are willing to invest time and effort to abandon joining existing groups and instead start their own, thereby reducing the success rate of group buying. The more leader rewards there are, the more groups are created, and the lower the success rate of each group. To improve the success rate, platforms may have to reduce the required group size, but this increases the number of groups and, consequently, raises the cost of leader incentives. Thus, when employing group buying strategies, platforms must comprehensively consider the interplay between group price, group size, and leader rewards to design effective strategies.

With the gradual rise in social commerce, an increasing number of sellers are leveraging social relationships to organize group buying. Manufacturers can sell homogeneous products through different platforms, and pricing across platforms may have cross effects on consumers. The group size and leader rewards on one platform can also influence the pricing, demand, and profits of competing platforms (Tang, 2022). For example, Meituan and Dianping may compete in group buying for the same hotel products. In a competitive environment, the settings for group size and leader rewards can simultaneously affect both rival platforms.

Considering the dual effects of leader rewards—while encouraging leaders to initiate and promote groups—may also reduce the success rate and scale of group buying as well as the mutual influence among competing platforms, social e-commerce platforms must design leader rewards and group buying strategies tailored to different market conditions. This study focused on the following two key questions.

**RQ1:** In social group buying channels, how do leader rewards interact with group price and size? How should social e-commerce platforms formulate leader-reward strategies to maximize profits in group sales?

**RQ2:** When two competing platforms sell homogeneous group-buying products, how do their group sizes and leader rewards influence each other owing to cross-platform effects? How should platforms set sales strategies to avoid competitive disadvantages?

## LITERATURE REVIEW

Group buying refers to a sales model that organizes dispersed online consumers to purchase products at a certain discount (Kauffman, 2001). Traditionally, online group buying involves businesses leveraging specialized group buying platforms (e.g., Lashou, Meituan, Juhuasuan) to offer products at discounted prices during specific periods, aiming to rapidly increase short-term sales. In this model, consumers primarily play a passive role as participants, and while the social marketing attributes of such group buying are present, they are not prominent. The existing research on traditional online group buying has focused primarily on three areas.

First, empirical studies have explored the factors that influence consumers' group-buying decisions. Kauffman et al. examined intrinsic factors such as perceived risk, price sensitivity, herd mentality, perceived usefulness, perceived ease of use, and time sensitivity (Kauffman, 2010; Ku, 2012; Leong, 2019; Li, 2018; Su, 2007). Guo et al. (2013) investigated external factors such as brand strength, discount depth, the duration of the group buying campaign, and the number of existing purchases (Zhang, 2013).

Second, quantitative models were used to analyze the effectiveness of the group-buying strategies. Anand et al. (2003) compared the profitability of group buying with that of other sales strategies to assess its effectiveness and applicable scenarios (Anand, 2003; Chen, 2007). Tang et al. incorporated consumer behavior factors to study optimal decisions regarding pricing, campaign duration, and minimum participant thresholds in group buying strategies (Chen, 2018; Deng, 2018; Guo, 2016; Hezarkhani, 2019; Ke, 2017; Marinesi, 2018; Wan, 2020).

Third, mathematical models are developed to compare group buying with hybrid marketing strategies. Hu et al. explored optimization issues, such as pricing strategies, competition mechanisms, quality routes, and information-sharing strategies, under group buying models (Chen, 2013; Hu, 2013; Jiang, 2018; Ni, 2015). Qi Yuqing et al. (Qi, 2023) argued that purchasing decisions are influenced not only by price and brand but also by the information consumers receive. They constructed a system dynamics model from the perspective of consumer information processing to simulate and predict the group-buying scale, sales volume, and other decision-making problems.

With the rapid development of social media, an increasing number of businesses have begun to consciously leverage the economic value of the social relationships of internet users. Proactively utilizing existing consumers' social behaviors to attract new customers and increase sales—referred to as social group buying—has become widespread in marketing practice. Consequently, related quantitative research has been conducted.

Jing and Xie were among the first to study social group buying on the basis of consumer-sharing behaviors. By comparing this model with traditional sales approaches, they explored its effectiveness (Jing, 2011). Scholars subsequently expanded the research on social group buying from the perspective of consumer recommendations. Chen and Zhang (2015) discuss the effectiveness of group-buying models and extend the analysis to include the impact of product-savvy consumers actively disseminating information on marketing outcomes (Chen, 2015). Hu Dongbin et al. built on Jing's work to study the influence of consumer diversity (e.g., sensitivity to waiting time and herd behavior) on group buying strategies (Hu, 2014). Zhang et al. fully considered the network effects of group buying on consumer behavior and investigated optimal decisions regarding group size and pricing strategies in multiparticipant campaigns (Cao, 2020; Ni, 2019; Zhang, 2016).

## MODEL AND EQUILIBRIUM ANALYSIS UNDER MONOPOLY CONDITIONS

Consider a two-tier supply chain comprising a manufacturer, a social e-commerce platform, and consumers. The manufacturer can sell products through traditional e-commerce retail channels or opt to distribute goods via group-buying mechanisms on a social e-commerce platform. To incentivize group buying leaders to organize group purchases more actively and attract more consumers to participate, the manufacturer may choose to provide certain rewards to these leaders through the platform. Figure 2 presents the market structure under investigation. The primary notations and definitions used in this study are summarized in Table 1.

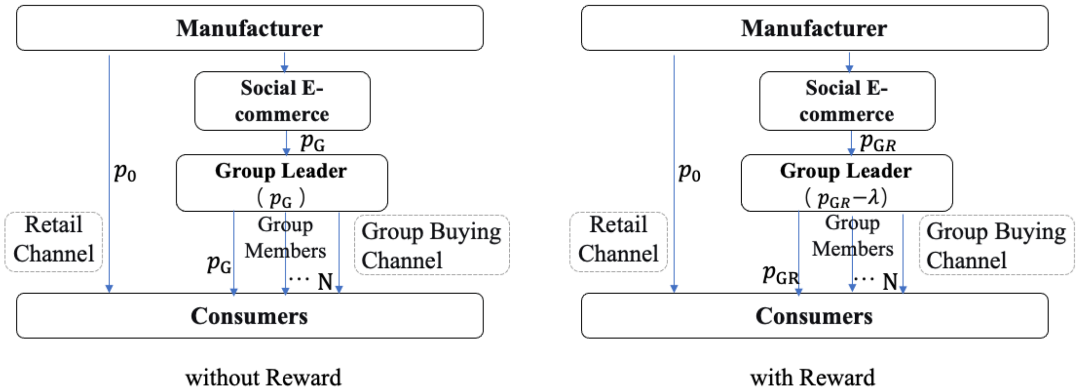



**Figure 2.** Comparative model architecture diagram of retail channels and group buying channels.

**Table 1.** Notation and meaning of the main parameters.

| Symbol | Meaning | Value Range |
|---|---|---|
| $\boldsymbol{a}$ | Market potential demand ($a_0$:retail channel, $a_1$: group buying channel) | $a > 0$ |
| $\boldsymbol{b}$ | Price sensitivity coefficient ($b_0$: retail channel, $b_1$: group buying channel) | $b > 0$ |
| $\boldsymbol{\rho}$ | Convincing cost per member recruited by the group leader | $\rho > 0$ |
| $\boldsymbol{\theta}$ | Probability of successful group formation | $0 < \theta < 1$ |
| c | Product cost price | $c > 0$ |
| $N$ | Number of new members recruited by the group leader (N+1: group size) | $N > 0$ |
| $\boldsymbol{\lambda}$ | Reward amount for the group leader | $\lambda > 0$ |
| $\boldsymbol{k}$ | Influence coefficient of group leader reward on group formation probability | $k > 0$ |
| $\boldsymbol{\sigma}$ | Cross-price influence coefficient | $\sigma > 0$ |
| $\boldsymbol{D_{N,G,L,F,R}}$ $\boldsymbol{\pi_{N,G,L,F,R}}$ | Demand (D) and profit (π) subscripts | N- Retail channel<br>G- Group buying channel<br>L- Group leader<br>F- Group member<br>R- With group leader reward |

**Equilibrium Analysis Without Group Leader Rewards**

A manufacturer sells identical products through both social group-buying and traditional retail channels. The demand in the traditional retail channel is given by $D_N=a_0-b_0p_0$, where $a_0$ represents the market potential demand, $b_0$ is the price sensitivity coefficient, and $p_0$ is the selling price in the retail channel.

Demand in the group-buying channel consists of two parts: the group leader's demand and the group members' demand. The group leader's demand arises naturally without additional social diffusion efforts, whereas the group members' demands are generated through the group leader's social efforts. Each group leader may bring in $N$ ($N \geq 1$) members. Assume that the required group size for a successful purchase is $N+1$, meaning that the group leader must recruit $N$ members to form the group. The convincing cost per member recruited is $\rho$, and the total convincing cost for recruiting $N$ members is $\rho N$. The probability of successful group formation was $\theta$. The product cost is c ($c < p_G < p_0$).

The group leader's demand is expressed as $D_L=\theta\left[a_1-b_1\left(p_G+\rho N\right)\right]$, where $a_1$ is the market potential demand for group buying and where $b_1$ is the price sensitivity coefficient in the group-buying market. The group members' demand is $D_F=ND_L$, and the total demand in the group-buying channel is $D_G=(N+1)D_L$.

The manufacturer's profit from the traditional retail channel is $\pi_N=(p_0-c)\,D_N$, and the profit from the group buying channel is $\pi_G=(p_G-c)D_G$. By taking the first-order derivatives of the profit functions, the equilibrium prices and demands are derived as follows:

$$p_0^* = \frac{a_0+b_0c}{2b_0},\ p_G^* = \frac{a_1+b_1c}{2b_1} - \frac{\rho N}{2},\ D_N^* = \frac{a_0-b_0c}{2},\ D_G^* = \frac{(N+1)\theta[a_1-b_1c-b_1\rho N]}{2}$$

$$\pi_N^* = \frac{(a_0-b_0c)^2}{4b_0},\quad \pi_G^* = \frac{(N+1)\theta[a_1-b_1(c+\rho N)]^2}{4b_1}$$

When no group leader reward is offered, to analyze the impact of group size N on demand and profit, we take the partial derivatives of the equilibrium group buying demand and profit with respect to N, yielding.

$$\frac{\partial D_G^*}{\partial N}=\frac{\theta[a_1-b_1c-b_1\rho(2N+1)]}{2},\quad \frac{\partial \pi_G^*}{\partial N}=\frac{\theta[a_1-b_1(c+\rho N)][a_1-b_1c-b_1\rho(3N+2)]]}{4b_1}$$

It can be concluded that Proposition 1 holds.

***Proposition 1:*** *In the absence of group leader rewards, as the group size N increases, the optimal group buying price decreases. The total group buying demand increases with N when* $N<\frac{a_1-b_1c}{2b_1\varrho}-\frac{1}{2}$*, and the total group buying profit increases with N when* $N<\frac{a_1-b_1c}{3b_1\varrho}-\frac{2}{3}$*. Given the assumption that* $N\geq 1$*, for the condition* $N<\frac{a_1-b_1c}{2b_1\varrho}-\frac{1}{2}$ *to hold, it is required that* $\frac{a_1-b_1c}{2b_1\varrho}-\frac{1}{2}\geq 2$.

Thus, when this inequality is satisfied, group buying can increase total demand. Similarly, for the condition $N<\frac{a_1-b_1c}{3b_1\varrho}-\frac{2}{3}$ to hold, it is required that $\frac{a_1-b_1c}{3b_1\varrho}-\frac{2}{3}\geq 2$. Hence, when this inequality is met, group buying can increase total profit. This leads to the following corollary.

***Corollary 1:*** *Only when the potential market size* $a_1$ *is sufficiently large and the unit convincing cost* $\varrho$ *is sufficiently small can an increase in group size N enhance both group buying demand and profit. For N=1 (*i.e., *a two-person group), an increase in group size will lead to higher demand for the manufacturer only when the potential market size and unit convincing cost satisfy* $a_1> b_1c+5b_1\varrho$*. Similarly, when* $a_1> b_1c+8b_1\varrho$*, an increase in group size will result in higher profit for the manufacturer.*

As *N* increases, to ensure that both demand and profit increase for the manufacturer, the potential market size $a_1$ must correspondingly increase, and the unit convincing cost $\rho$must decrease. Specifically, demand increases with *N* when $a_1 > b_1c + b_1\rho(2N+1)$, and profit increases with *N* when $a_1 > b_1c + b_1\rho(3N+2)$.

From Proposition 1 and Corollary 1, we can conclude that the group-buying model is unsuitable for products with high production costs, high unit convincing costs, and low market potential demand. Examples include emerging products with high technological complexity, which entail elevated costs and extended learning cycles, and require specialized sales personnel for promotion and popularization. Conversely, for daily necessities characterized by a large potential market size, low production costs, and minimal technological sophistication (thus eliminating the need for specialized marketing), converting marketing expenses into group buying discounts through this channel proves highly effective. This aligns with real-world market observations: group-buying commodities typically consist of familiar daily consumables, food items, books, and apparel, whereas high-tech products such as computers and smartphones are seldom sold via group-buying channels.

**Equilibrium Analysis with Group Leader Rewards**

To incentivize group leaders to exert more effort in recruiting new members and facilitating group purchases, manufacturers may consider offering them certain rewards. Suppose that, upon successful group formation, the manufacturer provides a group leader reward. In this case, the product price on the social e-commerce platform is denoted as $p_{GR}$, and the reward amount is $\lambda$ (where $0\leq\lambda\leq p_{GR}$; $\lambda=0$ indicates no reward, whereas $\lambda=p_{GR}$ implies that the group leader receives the product for free).

The introduction of a reward encourages more participants to initiate their own group as leaders, which may reduce the probability of successful group formation. We assume that the initial success rate of group formation is $\theta$ ($0<\theta<1$). After the reward is introduced, the success rate becomes $\frac{\theta}{1+k\lambda}$, where *k* is the influence coefficient of the reward on the success probability. This parameter also reflects the strength of the social relationship between the group leader and members: a smaller *k* indicates stronger social ties, meaning that the reward has less of an impact on the success rate.

The demand in the traditional retail channel remains unchanged, as $D_N$. The group leader's demand is now given by $D_{LR}=\frac{\theta}{1+k\lambda}[a_1-b_1(p_{GR}+\rho N-\lambda)]$, and the group members' demand is $D_{FR}=ND_{LR}R$. The total demand in the group-buying channel is $D_{GR}=(N+1)D_{LR}$. The manufacturer's profit is $\pi_{GR}=D_{GR}(p_{GR}-c)-\lambda D_{LR}$. By taking the first-order derivatives of the profit function, we derive the equilibrium prices and demand as follows:

$$p_0^*=\frac{a_0+b_0c}{2b_0},\ p_{GR}^*=\frac{a_1+b_1c}{2b_1}-\frac{\rho N}{2}+\frac{\lambda N}{2(N+1)},$$

$$D_{NR}^*=\frac{a_0-b_0c}{2},\quad D_{GR}^*=\frac{(N+1)\theta\left[(a_1-b_1c-b_1\rho N+b_1\lambda)+\frac{b_1\lambda}{N+1}\right]}{2(1+k\lambda)}$$

$$\pi_{NR}^*=\frac{(a_0-b_0c)^2}{4b_0},\quad \pi_{GR}^*=\frac{\theta(N+1)\left[(a_1-b_1c-b_1\rho N+b_1\lambda)+\frac{b_1\lambda}{N+1}\right]\left[(a_1-b_1c-b_1\rho N+b_1\lambda)-\frac{3b_1\lambda}{N+1}\right]}{4b_1(1+k\lambda)}$$

Table 2 presents a comparative analysis of the equilibrium outcomes with and without group leader rewards. By calculating the differences in price, demand, and profit between the reward and non-reward scenarios, the changes in the equilibrium price, demand, and profit under the reward mechanism are derived, leading to Proposition 2.

*Proposition 2: Compared with the scenario without group leader rewards, the equilibrium group buying price increases when rewards are offered, and the price difference* $\Delta p = p_{GR}^* - p_G^* = \frac{\lambda N}{2(N+1)}$. *When the condition* $a_1 - b_1 c - b_1 \rho N < \frac{b_1}{k}$ *is satisfied, demand also increases, and the demand difference* $\Delta D = D_{GR}^* - D_G^* = \frac{\lambda\theta[b_1 - k(a_1 - b_1 c - b_1 \rho N)]}{2(1+k\lambda)}$. *The change in profit is given by* $\Delta\pi = \pi_{GR}^* - \pi_G^* = \frac{\lambda b_1^2(N^2-4)+(N+1)(a_1-b_1c-b_1\rho N)[2b_1N-(N+1)k(a_1-b_1c-b_1\rho N)]}{(N+1)(1+k\lambda)}$.

**Table 2.** Optimal prices, demand, and profits under monopoly.

| | Price (p) | Demand (D) |
|---|---|---|
| **Without Reward** | $p_G^* = \frac{a_1+b_1c}{2b_1} - \frac{\rho N}{2}$ | $D_G^* = \frac{(N+1)\theta[a_1-b_1c-b_1\rho N]}{2}$ |
| **With Reward** | $p_{GR}^* = \frac{a_1+b_1c}{2b_1} - \frac{\rho N}{2} + \frac{\lambda N}{2(N+1)}$ | $D_{GR}^* = \frac{(N+1)\theta\left[(a_1-b_1c-b_1\rho N+b_1\lambda)+\frac{b_1\lambda}{N+1}\right]}{2(1+k\lambda)}$ |
| | Profit (π) | |
| **Without Reward** | $\pi_G^* = \frac{(N+1)\theta[a_1-b_1(c+\rho N)]^2}{4b_1}$ | |
| **With Reward** | $\pi_{GR}^* = \frac{\theta(N+1)\left[(a_1-b_1c-b_1\rho N+b_1\lambda)+\frac{b_1\lambda}{N+1}\right]\left[(a_1-b_1c-b_1\rho N+b_1\lambda)-\frac{3b_1\lambda}{N+1}\right]}{4b_1(1+k\lambda)}$ | |

**Analysis of Changes in Price and Demand**

The introduction of group leader rewards increases the manufacturer's costs, leading to a higher product selling price. Ultimately, consumers bear the costs of these rewards through price increases. The magnitude of the price increase is positively correlated with both the group size *N* and the reward amount *λ*. Specifically, as *N* increases, the price increase approaches half the reward amount, *λ*.

The ratio of the price sensitivity coefficient $b_1$ to the influence coefficient of rewards on the group formation probability *k* plays a critical role in determining the change in demand with and without rewards. Demand increases when N> $\frac{a_1-b_1c-\frac{b_1}{k}}{b_1\rho}$. A higher ratio $\frac{b_1}{k}$ facilitates demand expansion, implying that rewards are more likely to increase demand when consumers are highly price sensitive but less responsive to reward incentives.

Rewards are particularly effective in expanding demand when the market consists predominantly of price-sensitive consumers who are indifferent to the reward mechanisms. Manufacturers should consider the composition of consumer groups. In communities with strong social ties, where consumers exhibit altruistic tendencies and high price sensitivity, rewards can effectively stimulate demand. Conversely, in networks dominated by weak social relationships, rewards may incentivize excessive group initiation, reduce the success rate of group formation, and ultimately diminish manufacturer profits.

**Analysis of Profit Changes**

The impact on profit is complex and requires case-specific discussion.

**For** *N*=1 (two-person groups), $\Delta\pi_1 = \frac{-3\lambda b_1^2+4(a_1-b_1c-b_1\rho)[b_1-k(a_1-b_1c-b_1\rho)]}{2(1+k\lambda)}$; when the conditions $(a_1 - b_1c - b_1\rho) < \frac{b_1}{k}$ and $\lambda < \frac{4(a_1-b_1c-b_1\rho)[b_1-k(a_1-b_1c-b_1\rho)]}{3b_1^2}$ are satisfied, $\Delta\pi_1$ >0. Moreover, a larger *λ* reduces the increase in profit.

For *N*=2, $\Delta\pi_2 = \frac{3(a_1-b_1c-2b_1\rho)[4b_1-3k(a_1-b_1c-2b_1\rho)]}{3(1+k\lambda)}$. When $(a_1 - b_1c - 2b_1\rho) < \frac{4b_1}{3k}$, $\Delta\pi_2$ >0. In this case, regardless of *λ*, its increase diminishes the profit difference.

For *N*=3: $\Delta\pi_3 = \frac{5\lambda b_1^2+4(a_1-b_1c-3b_1\rho)[6b_1-4k(a_1-b_1c-3b_1\rho)]}{4(1+k\lambda)}$. When $(a_1 - b_1c - 3b_1\rho) < \frac{3b_1}{2k}$, $\Delta\pi_3$ >0 holds for any *λ*, and a larger *λ* amplifies the profit increase.

For *N*>3, the propositions are analogous to those for *N*=3 and are not reiterated here.

Further analysis of the effect of *λ* on $\Delta\pi$ leads to **Corollary 2.**

***Corollary 2:*** *Compared with the scenario without group leader rewards, the impact of the reward amount λ on the manufacturer's profit change depends on the value of N:*

*For N=1 and N=2, a larger λ reduces the profit gain from introducing rewards. In these cases, implementing rewards is* ***not recommended.*** *For N>2, when k is sufficiently small such that* $b_1^2(N^2-4) - k(N+1)(a_1-b_1c-b_1\rho N)[2b_1N-(N+1)k(a_1-b_1c-b_1\rho N)] > 0$, *an increase in λ enhances the profit improvement from rewards. Here, implementing rewards* *is **recommended**. When the group size exceeds three members (N+1>3), introducing rewards is more likely to increase the manufacturer's profit; otherwise, it is not advised.*

This conclusion aligns with the observations. When manufacturers initiate group buying by lowering prices and sacrificing partial profits, their goal is to leverage group leaders' familiarity with products and their close relationships within social circles to expand sales and reduce marketing costs. For small group sizes, the manufacturer's objective of demand expansion cannot be achieved, and offering rewards would further lead to financial losses.

When group leaders have the capacity to increase group size and generate higher sales volume through lower profit margins (volume-over-margin strategy), it becomes a win–win strategy for manufacturers to share partial profits as incentives to further expand group size.

Manufacturers should thoroughly consider the market attributes of target products when setting group sizes and reward mechanisms: sufficient market potential is necessary to ensure appropriate group size; products with high public familiarity reduce group leaders' recruitment costs and facilitate group expansion; price-sensitive consumer groups are more suitable for group buying initiatives; and rewards should be introduced only when there is adequate group size assurance and the target market shows low sensitivity to reward mechanisms.

Community group buying serves as an illustrative example: Residents within the same community often share strong social connections. Even when aware of manufacturers' rewards to group leaders, they are willing to participate in enjoying group prices while supporting their neighbors' side businesses. In larger communities, rewards incentivize leaders to continuously expand their group size, allowing manufacturers to significantly broaden their markets with relatively low incentive costs. However, the resulting price increase may reduce consumer willingness to participate. Manufacturers should absorb partial reward costs rather than transferring them excessively to consumers.

**Numerical Analysis**

To further analyze the impact of group leader rewards on platform profits, numerical simulations were conducted to examine the influencing factors and trends. Assuming that $a_1$=150, $b_1$=5, $c$=6, $\varrho$=2, and $k$=0.01, the relationship between $\Delta\pi$ and $\lambda$ is as shown in Figure 2.

Figure 2 visually demonstrates how the profit difference varies with the reward amount under different values of $N$.

For $N$=1, the profit difference decreases as the reward increases, indicating that **rewards are not recommended**.

For $N$=2, the reward amount **does not affect** the profit difference.

For $N$≥3, the profit difference increased with the reward amount, and larger $N$ values led to **faster growth**, making rewards **highly recommended.**

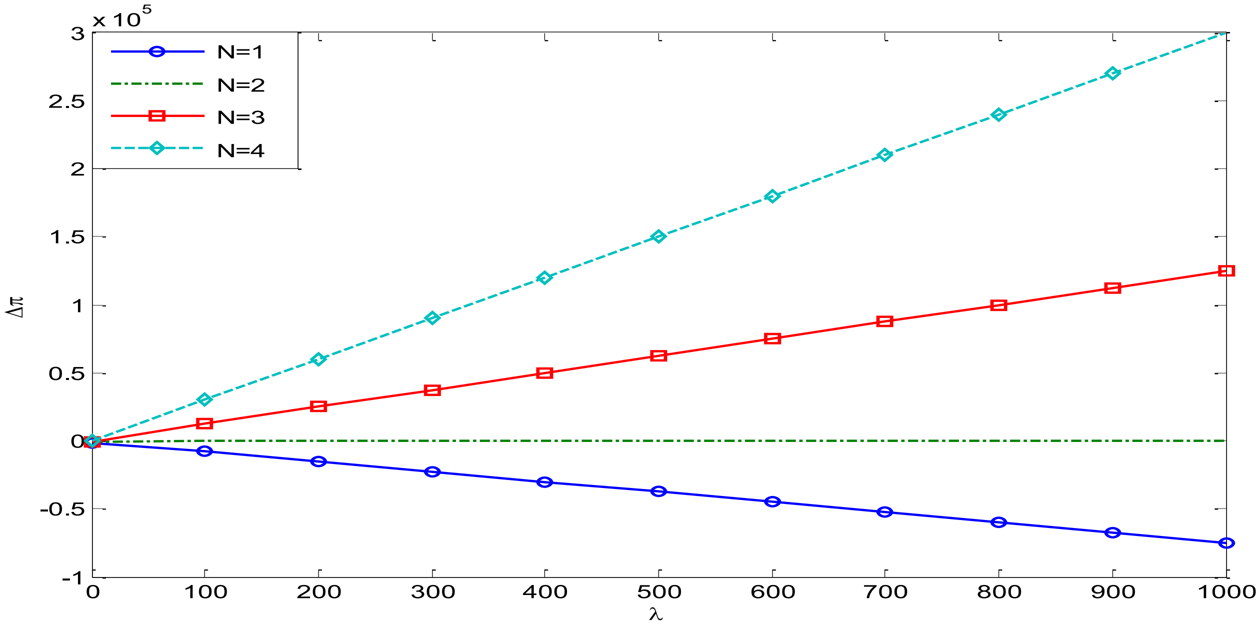



**Figure 2.** Variation in the profit difference with the group leader reward investment under different values of N.

**The numerical analysis results visually validate the previous analytical conclusions:** when the group size is small, the platform should avoid offering group leader rewards. Conversely, when the group size is sufficiently large, introducing rewards is an effective means of enhancing profitability in group buying.

Therefore, when formulating group buying strategies, platforms must **dynamically adjust reward policies on the basis of real-time group size data** to ensure that the strategy remains optimized and that profitability is consistently improved.

## MODEL AND EQUILIBRIUM ANALYSIS UNDER COMPETITIVE CONDITIONS

The social e-commerce landscape is inherently competitive, with major e-commerce and social media platforms increasingly adopting group-buying models, making competition a more realistic market state. This section examines the application of group-buying strategies to social e-commerce platforms in competitive scenarios.

Given that prices across platforms often exhibit cross-effects, platforms must not only consider their own pricing, group size, and reward mechanisms but also account for the influence of competitors.

Assume that two homogeneous group-buying platforms sell the same product with identical production costs. If both platforms 1 and 2 adopt group-buying sales models, with group buying prices $p_1$ and $p_2$, cross-price influence coefficient $\sigma$, group sizes $N_1$ and $N_2$, and group leader rewards $\lambda_1$ and $\lambda_2$, the following discussion addresses the two aspects of whether to offer rewards. The framework is illustrated in Figure 3.

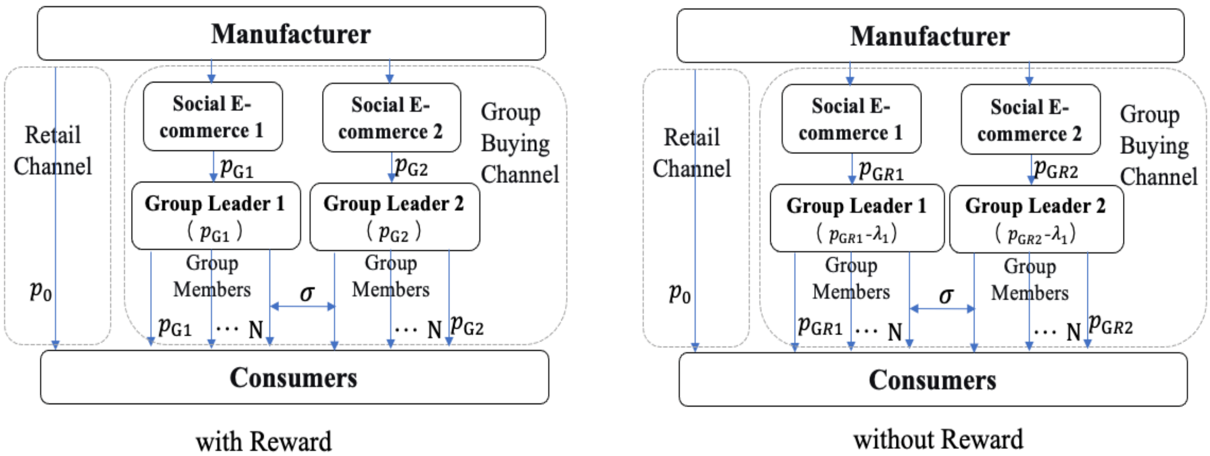



**Figure 3.** Comparative model architecture diagram: with vs. without group leader rewards in two-platform competition.

### Equilibrium Analysis Without Group Leader Rewards

Following the assumption in Section 3.2, when no group leader rewards are offered, the group buying demand for platform $i$ is $D_{Gi} = \theta(N_i + 1)[a_i - b_i(p_{Gi} + \rho N_i) + \sigma p_{Gj}]$, and the group buying profit is $\pi_{Gi} = (p_{Gi} - c)D_{Gi} = \theta(N_i + 1)[a_i - b_i(p_{Gi} + \rho N_i) + \sigma p_{Gj}]\ (p_{Gi} - c)$ i, j=1, 2.

By taking the partial derivatives of the profit function with respect to $p_{Gi}$ and $p_{Gj}$, the optimal group buying prices $p^*_{Gi}$ and $p^*_{Gj}$ are derived. Substituting these into the demand and profit functions yields optimal demand and profit. The equilibrium results are as follows.

$$p^*_{Gi} = \frac{2b_j(a_i+b_ic-b_i\rho N_i)+\sigma(a_j+b_jc-b_j\rho N_j)}{4b_ib_j-\sigma^2} \quad i,j=1,2$$

$$D^*_{Gi} = \frac{b_i(N_i+1)[2b_j(a_i-b_ic-b_i\rho N_i)+b_i\sigma(a_j+b_jc-b_j\rho N_j+\sigma c)]}{4b_ib_j-\sigma^2}$$

$$\pi^*_{Gi} = \frac{b_i(N_i+1)\ [2b_j(a_i-b_ic-b_i\rho N_i)+b_i\sigma(a_j+b_jc-b_j\rho N_j+\sigma c)]^2}{(4b_ib_j-\sigma^2)^2}$$

To ensure positive equilibrium prices, demand, and profits, condition $4b_ib_j - \sigma^2 > 0$ must be satisfied. By analyzing the expressions for demand and profit of both platforms under competition without rewards, it can be observed that a platform's optimal demand and profit depend not only on its own parameters but also on those of the competitor. Specifically, Proposition 3 is derived as follows.

***Proposition 3:*** *When two competing group-buying platforms do not offer group leader rewards,* $\frac{\partial p_{Gi}^*}{\partial N_i} < 0$; $\frac{\partial p_{Gi}^*}{\partial N_j} < 0$; $\frac{\partial D_{Gi}^*}{\partial N_j} < 0$; $\frac{\partial \pi_{Gi}^*}{\partial N_j} < 0$;

$$\text{When } N_i < N_{i1} = \frac{2b_j(a_i - b_i c) + b_i\sigma(a_j + b_j c)}{4b_i b_j \rho} - \frac{\sigma N_j}{4} + \frac{\sigma^2 c}{4b_j\rho} - \frac{1}{2}, \frac{\partial D_{Gi}^*}{\partial N_i} > 0;$$

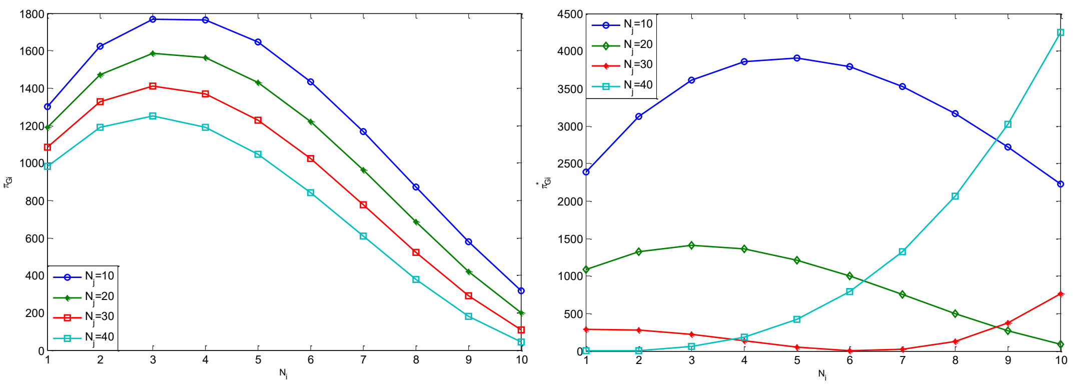
$$\text{When } N_i < N_{i2} = \frac{2b_j(a_i - b_i c) + b_i\sigma(a_j + b_j c)}{6b_i b_j \rho} - \frac{\sigma N_j}{6} + \frac{\sigma^2 c}{6b_j\rho} - \frac{2}{3}, \frac{\partial \pi_{Gi}^*}{\partial N_i} > 0;$$

An expansion in the group-buying scale of a competitor platform reduces the equilibrium price, demand, and profit of the local platform**.** The magnitude of this reduction is positively correlated with the local platform's group size, the price sensitivity coefficients of both platforms, the cross-price impact coefficient, and the unit convincing cost. The equilibrium price decreases when the local platform expands its group size. Both equilibrium demand and profit increase with increasing group size provided that the group size does not exceed a certain threshold. The value of this threshold is related to a competitor's group size. We define $\frac{\partial N_{i1}}{\partial N_j} = -\frac{\sigma}{4}$ as the **cross-size impact coefficient for demand** and $\frac{\partial N_{i2}}{\partial N_j} = -\frac{\sigma}{6}$ as the **cross-size impact coefficient for profit**. A larger competitor group size reduces the scope for the local platform to increase its demand and profit by expanding its own group size. The specific degree of the impact is proportional to the cross-price impact coefficient between the two platforms. A larger cross-price impact coefficient results in larger cross-size impact coefficients for demand and profit, indicating that the local platform is more significantly affected by the scale of the competitive platform.

When a platform expands its group-buying scale, the equilibrium price decreases, but both demand and profit may increase under certain conditions. However, the extent of this improvement is constrained by the scale of the competitive platform. If a competitor's group-buying scale is large, the local platform's ability to increase demand and profit through expansion is limited. Conversely, if the competitor's scale is small, the local platform can expand its group-buying scale safely. When the competitor platform expands its group-buying scale, the local platform's equilibrium price, demand, and profit decrease as the competitor's scale increases. Moreover, the larger the scale of the local platform is, the faster its demand and profit decline. This finding demonstrates that, in a competitive environment, the group-buying scales of the two platforms mutually constrain each other. Therefore, when deciding on its group-buying scale, a platform must fully consider the scale of its competitor.

Further numerical analyses were conducted via a case study. Assuming that $a_1 = a_2 = 150$, $b_1 = b_2 = 5$, $c = 6$, $\rho = 2$,, the profit trend with respect to $N_i$ under different values of $N_j$ is shown in Figure 4. As illustrated in Figure 4(a), when $\sigma$ is small (e.g., $\sigma$=0.1), for small $N_j$, the profit initially increases and then decreases as $N_i$ increases. As $N_j$ increases, the platform's profit decreases with the expansion of $N_i$. This aligns with the previous analysis: when a competitor's group size increases, the local platform's capacity to increase demand and profit by expanding its own group size becomes more constrained.

In Figure 4(b), where $\sigma$ is large (e.g., $\sigma$=1), when $N_j$ is small, the profit initially increases and then decreases as $N_i$ increases. For $N_j$=30, profit first decreases and then gradually increases. When $N_j$ is large, the profits for both competing platforms consistently increase with the expansion of $N_i$. Thus, under large $\sigma$ conditions, when $N_i$ is small, maintaining $N_j$ within a lower range yields better profit returns. As the competitor's scale $N_j$ further increases, the platform's profit continues to increase with $N_i$, and larger $N_j$ values lead to faster and sustained profit growth.




(a) and (b).

**Figure 4.** Schematic diagram of profit growth trends with respect to *Ni* under different *Nj values.*

This phenomenon reveals the essence of the platform scale strategy in competitive environments: **the cross–price influence coefficient (σ) directly affects the type of game-theoretic interaction in scale decisions**.

When σ is small (e.g., σ = 0.1), demand substitutability between platforms is weak, and consumers are less sensitive to price differences. In this case, forming **differentiated scale advantages** becomes the optimal strategy. If a competitor expands its scale, the local platform can contract its scale to avoid direct price wars, instead targeting smaller, price-sensitive market segments to maximize profits. This complementary pattern of "you expand, I contract" essentially constitutes a Nash equilibrium, where both parties reduce market friction through differentiated competition.

When σ is large (e.g., σ = 1), demand substitutability increases significantly, and consumers easily switch between platforms because of price fluctuations. In such scenarios, adopting a differentiated-scale strategy may lead to rapid demand loss for the platform that contracts its scale. Conversely, **a coordinated scale expansion** generates dual positive effects. The first is **the market education effect,** which means that simultaneous scale expansion by both platforms enhances consumer awareness of the group-buying model, reducing market promotion costs. The second is **the network effect,** which means that synchronized scale expansion increases the success rate of group purchases, creating a positive feedback loop between scale and demand.

However, coordinated expansion requires **effective cost control capabilities**. If the convincing unit cost (ϱ) is too high, scale expansion may erode profits. Platforms must develop **dynamic game models** by continuously monitoring competitors' scale dynamics and price elasticity: When σ is small, they must activate a "differentiated scale response mechanism" and focus on niche markets if competitors expand; when σ is large, they must activate a "coordinated scale mechanism" and adjust scales synchronously while reducing ϱ through technological means (e.g., optimizing group leader training systems).

Ultimately, platforms should establish a **competitive intelligence system** to estimate real-time changes in σ via big data, thereby ensuring that their scale strategies remain adaptive to the competitive environment. This dynamic optimization capability serves as a core barrier for social e-commerce platforms to achieve excess profits in intense competition.

**Equilibrium Analysis with Group Leader Rewards**

When two group-buying platforms compete and group leader rewards are offered, on the basis of previous assumptions, the reward amounts for the two platforms are denoted as $\lambda_1$ and $\lambda_2$. The market demand and profit for the group-buying operations of the two platforms are as follows.

$$\mathrm{D}_{GRi} = \frac{\theta(N_i+1)}{1+\mathrm{k}\lambda_i}\left[a_i - b_i(p_i + \rho N_i - \lambda_i) + \sigma p_{GRj}\right]$$

$$\pi_{GRi} = \mathrm{D}_{GRi}(p_{GRi} - c) - \lambda_i \mathrm{D}_{\mathrm{L}Ri} \quad i, j = 1, 2$$

The equilibrium prices, demands, and profits are derived by taking the first-order derivatives of the profit functions as follows.

$$p^*_{GRi} = \frac{2b_jM_i+\sigma M_j}{4b_ib_j-\sigma^2} + \frac{2b_ib_j\lambda_i}{(4b_ib_j-\sigma^2)(N_i+1)} + \frac{\sigma b_j\lambda_j}{(4b_ib_j-\sigma^2)(N_j+1)}$$

$$D^*_{GRi} = \frac{b_i\theta(N_i+1)}{1+\mathrm{k}\lambda_i}\left[\frac{2b_jM_i+b_i\sigma(M_j+\sigma c)]}{4b_ib_j-\sigma^2} + \frac{\sigma b_j\lambda_j}{(4b_ib_j-\sigma^2)(N_j+1)} - \frac{\lambda_i(2b_ib_j-\sigma^2)}{(4b_ib_j-\sigma^2)(N_i+1)}\right]$$

$$\pi^*_{GRi} = \frac{b_i\theta(N_i+1)}{1+\mathrm{k}\lambda_i}\left[\frac{2b_jM_i+\sigma M_j+\sigma^2 c}{4b_ib_j-\sigma^2} + \frac{\sigma b_j\lambda_j}{(4b_ib_j-\sigma^2)(N_j+1)} - \frac{\lambda_i(2b_ib_j-\sigma^2)}{(4b_ib_j-\sigma^2)(N_i+1)}\right]\left[\frac{2b_jM_i+\sigma M_j}{4b_ib_j-\sigma^2} + \frac{\sigma b_j\lambda_j}{(4b_ib_j-\sigma^2)(N_j+1)} - \frac{\lambda_i(2b_ib_j-\sigma^2)}{(4b_ib_j-\sigma^2)(N_i+1)} - c)\right] \quad i, j = 1,2$$

where $M_i = a_i - b_ic - b_i\rho N_i + b_i\lambda_i$, $M_j = a_j + b_jc - b_j\rho N_j + b_j\lambda_j$

Proposition 4 is derived by analyzing the impact of $\lambda_i$ on the equilibrium price, demand, and profit of its own platform, as well as those of the competitor platform.

***Proposition 4:*** *When two group-buying platforms compete and each offers group leader rewards,* $\frac{\partial p^*_{GRi}}{\partial \lambda_i} > 0$; $\frac{\partial p^*_{GRi}}{\partial \lambda_j} > 0$; $\frac{\partial D^*_{Gi}}{\partial \lambda_i} > 0$; $\frac{\partial D^*_{Gi}}{\partial \lambda_j} > 0$; *and when* $\frac{N_i+1}{N_j+1} > \frac{\lambda_i(2b_ib_j-\sigma^2)}{\sigma b_j\lambda_j}$ *is satisfied,* $\frac{\partial \pi^*_{Gi}}{\partial \lambda_i} > 0$, $\frac{\partial \pi^*_{Gi}}{\partial \lambda_j} > 0$.

When the group leader rewards of both platforms increase, both their equilibrium prices and demand rise. However, the impact of rewards on prices and demand diminishes as group size increases. When the condition $\frac{N_i+1}{N_j+1} > \frac{\lambda_i(2b_ib_j-\sigma^2)}{\sigma b_j\lambda_j}$ is satisfied, the profits of both platforms increase with increasing group-leader rewards. If $2b_ib_j - \sigma^2 < 0$, it always holds that $\frac{\partial \pi^*_{Gi}}{\partial \lambda_i} > 0$ and *that* $\frac{\partial \pi^*_{Gi}}{\partial \lambda_j} > 0$; If $2b_ib_j - \sigma^2 > 0$, the ratio of group sizes between the two platforms influences how profits change with rewards. When $\frac{N_i+1}{N_j+1} / \frac{\lambda_i}{\lambda_j} > \frac{2b_ib_j-\sigma^2}{\sigma b_j}$, the profits of both platforms increase with increasing rewards. This finding indicates that, when the ratio of group sizes exceeds the ratio of reward investments, introducing rewards is more beneficial for both platforms' profits. Specifically, the larger a platform's group size relative to its competitor is, the greater the profit gained from offering rewards. Conversely, if a competitor's group size is larger, increasing rewards may not be an optimal strategy for the local platform.

The introduction of group leader rewards increases the equilibrium prices and demand of both competing platforms. When the group size is large, the impact of the reward changes on prices and demand diminishes. This can be understood as follows. Under a fixed reward amount, the more new members a group leader recruits, the lower the average recruitment cost per new member, thereby reducing the influence on prices and demands. When the cross-price influence coefficient is large (satisfying $2b_ib_j - \sigma^2 < 0$), the equilibrium profits of both platforms increase with higher group leader rewards regardless of the group size relationship. However, when the cross-price influence coefficient is small (i.e., $2b_ib_j - \sigma^2 > 0$), the ratio of group sizes between platforms directly affects how rewards impact profits. If the local platform's group size is significantly larger than that of the competitor, introducing higher rewards can be beneficial provided that the ratio of group sizes exceeds the ratio of reward amounts. When the cross-price influence coefficient is small, platforms must consider a competitor's scale when introducing rewards. If a competitor's group size is small, introducing rewards can increase the local platform's profit. Conversely, if the competitor already has a large group size, introducing rewards may reduce the local platform's profit and lead to losses.

The above conclusions reveal a core paradox in group leader reward strategies within competitive environments: The effectiveness of reward mechanisms highly depends on the intensity of competition (*σ*) and the relative scale advantage ($\boldsymbol{N_i/N_j}$) between platforms**.** Below is a detailed analysis of the specific scenarios.

**We performed an in-depth mechanistic analysis as follows.** The effectiveness of group leader rewards is fundamentally shaped by two core mechanisms: the *dilution effect of scale* and the *double-edged role of competition intensity (σ)*. Under a fixed reward amount, larger group sizes (e.g., $N_i$=50 vs. $N_i$=10) drastically reduce the per-user recruitment cost (e.g., from 1.0 to 0.2), diminishing the impact on prices and demands and granting platforms greater pricing flexibility. Simultaneously, the competition intensity σ dictates strategic outcomes: in high-σ scenarios (σ>0.8, e.g., homogeneous markets such as fresh produce), reward increases by both platforms create a "resonance effect" - expanding total market demand and forming a positive-sum game, whereas in low-σ scenarios (σ<0.5, e.g., differentiated niches such as books vs. apparel), unilateral reward hikes trigger zero-sum prisoner dilemmas, leading to retaliatory wars and profit erosion. Thus, reward strategies must dynamically adapt to both scale advantages and competitive landscapes.

The following two case studies demonstrate this mechanism in action.

Case 1: Community Fresh Produce Group Buying (High-σ Environment)

Platforms A ($N_i$=40) and B ($N_j$=30) sold similar vegetable baskets (σ=1.1). When they simultaneously increased rewards from λ=5 to λ=8, by applying calculations to the theoretical formulas in this study, demand increased by 18% and 12%, respectively, prices increased by 3% and 2.5%, and profits surged by 22% and 15%, respectively, as shown in Table 3. Reward expansion activated latent users, increasing total market orders by 25%, whereas scale effects absorbed cost pressures.

**Table 3.** Case 1: Data presentation.

| Metric | Platform A change | Platform B change |
|---|---|---|
| **Demand** | +18% | +12% |
| **Price** | +3% | +2.5% |
| **Profit** | +22% | +15% |

Case 2: Vertical Niche Group Buying (Low-σ Environment)

Platform A ($N_i$=20, maternal/child products) unilaterally raised rewards from λ=6 to λ=10, whereas Platform B ($N_j$=45, home goods) remained unchanged (σ=0.4). By applying calculations to the theoretical formulas in this study, platform A saw a mere 5% demand increase but a 1% price decline and 8% profit loss, whereas Platform B gained 3% profit by capturing churned users, as shown in Table 4. Low substitutability prevented market expansion, and soaring acquisition costs (per-user cost jumping from 0.3 to 0.5) eroded profitability.

**Table 4.** Case 2: Data presentation.

| Metric | Platform A change | Platform B change |
|---|---|---|
| **Demand** | +5% | -2% |
| **Price** | -1% (forced reduction) | Unchanged |
| **Profit** | -8% | +3% (harvesting churned users) |

From the above analysis and case studies, we derive the following managerial implications: Platforms must dynamically monitor the competition coefficient (σ) via real-time estimation systems. For example, price-demand elasticity models are updated weekly to activate the "reward coordination mode" when σ > 0.8 or the "reward caution mode" when σ < 0.5. Under asymmetric scales, an aggressive reward strategy (λ 20–30% higher than that of competitors) is adopted if $N_i/N_j$ > 1.5 to exploit significant scale advantages, or a focused reward strategy (λ at the industry average) is adopted if $N_i/N_j$ < 0.7 to avoid losing cost control while serving core users. In high-σ industries such as fast-moving consumer goods (FMCG), cross-platform collaboration, such as dynamically capping maximum rewards (e.g., λ ≤ 15% of the product price), can prevent prisoners' dilemmas. Ultimately, reward strategies require integration into a closed-loop system of "competitive intelligence → elasticity calculation → dynamic adjustment" to align with competitive intensity, scale disparities, and product characteristics for sustained profitability.

Group leader rewards are never isolated decisions. They must be optimized within the three-dimensional framework of a competitive environment, scale comparison, and product characteristics. Platforms need to build a closed-loop system of "competitive intelligence → elasticity calculation → dynamic adjustment" to consistently benefit from reward gaming.

## CONCLUSIONS

Group buying has been widely adopted on social e-commerce platforms, yet its strategic implementation requires careful consideration of multiple interrelated factors, such as group size, pricing, and group leader rewards. In competitive environments, where the same merchant simultaneously employs group-buying strategies across multiple platforms, interactions between platforms further complicate decision making. Effectively configuring rewards and fully accounting for relevant influencing factors and market conditions are critical challenges for successful group buying applications.

While existing research on social e-commerce group buying strategies has explored how consumer segmentation affects group pricing, scale, and profits, few studies have simultaneously incorporated product pricing, group size, and other factors to examine group-leader rewards. To address this gap, this study constructs models for both monopoly and competitive scenarios to investigate whether manufacturers should introduce group leader rewards, how to implement them, and the interplay among group-buying pricing, group size, market factors, and reward levels. The study yielded the following key conclusions:

(1) In a monopoly market environment, an increase in group size (N) enhances group buying demand and profit only when the potential market size ($\boldsymbol{a_1}$) is sufficiently large and the unit convincing cost (ρ) is sufficiently low. Specifically, demand increases with N when $a_1 > b_1 c + b_1 \rho(2N+1)$, and profit increases with N when $a_1 > b_1 c + b_1 \rho(3N+2)$.

When group leader rewards are introduced, platform costs increase, leading to higher prices that are ultimately borne by consumers. The price increase escalates with larger N and λ, and the portion of the price increase absorbed by consumers approaches half of the reward amount as N increases.

If the social relationship between group leaders and members is strong, introducing rewards can increase demand more easily; otherwise, it merely increases the number of groups while reducing the success rate of group formation. For larger group sizes (three or more participants), introducing rewards is more likely to increase platform profits; otherwise, they are not recommended.

(2) In a competitive environment, an expansion of the group-buying scale by a rival platform reduces the equilibrium price, demand, and profit of the local platform. The magnitude of this reduction is positively correlated with the local platform's group size, the price sensitivity coefficients of both platforms, the cross-price impact coefficient, and the unit convincing cost.

The equilibrium price decreases when the local platform expands its group size. Both equilibrium demand and profit increase with increasing group size provided that the group size does not exceed a certain threshold. The larger the rival platform's group size is, the smaller the scope for the local platform to increase its demand and profit by expanding its own group size.

(3) If both competing platforms introduce group leader rewards, the equilibrium prices and demands of both platforms increase simultaneously. When the group size is large, the impact of reward changes on prices and demand diminishes.

When the cross-price impact coefficient is large (satisfying $\sigma^2 > 2b_i b_j$), the equilibrium profits of both platforms increase with increasing group leader rewards. When $\sigma^2 < 2b_i b_j$, the ratio of group sizes between platforms directly influences the effect of rewards on profit. If the local platform's group size is significantly larger than that of the competitor, introducing rewards can benefit the platform. However, if the competitor's scale also increases, the advantage of the local platform's rewards diminishes, and caution is required when increasing reward amounts.

Introducing rewards is more beneficial for both platforms when the ratio of their group sizes exceeds that of their reward amounts.

On the basis of the key research findings, the following managerial implications are proposed for the application of group buying in social commerce:

**(1) When setting the group size and leader rewards, platforms must thoroughly investigate market influencing factors.** Expanding the group size increases merchant profits only when the potential market size is sufficiently large and the unit convincing cost is low. Group buying strategies are not recommended for products with a small market size and high unit convincing costs (e.g., emerging high-tech products with high technical complexity). Conversely, for low-complexity goods with high daily demand (e.g., daily necessities, food, apparel), group-buying strategies can effectively expand market demand and increase marketing profits.

**(2) Introducing leader rewards requires careful consideration of user sensitivity to rewards.** When the market largely consists of users with high price sensitivity but low reward sensitivity, introducing rewards can increase merchant profits. Reward sensitivity reflects the strength of the social relationships between leaders and members. Strong social relationships enhance the effectiveness of rewards, whereas weak relationships may reduce group success rates and overall benefits. Therefore, decision makers must assess the strength of these social relationships to determine whether to introduce rewards and set appropriate reward levels.

**(3) In competitive environments with two group-buying platforms, the interaction trend depends on the cross–price impact coefficient.** When this coefficient is small, group sizes tend to be complementary: if the competitor's scale is large, blindly expanding the local scale is unwise; if the competitor's scale is small, local expansion is beneficial. When the coefficient is large, synchronizing scale changes (both expanding and contracting) benefit both platforms. Platforms must consider this coefficient and adjust their strategies dynamically.

**(4) When rewards are introduced in competitive scenarios, both the cross–price coefficient and the ratio of group sizes are monitored.** If the cross-price impact coefficient is large, platforms can aggressively introduce rewards without excessive concern for their competitors. If the coefficient is small, the competitor's scale is dynamically observed; rewards are beneficial only when the competitor's scale is small. If the competitor already has a large scale, it avoids high rewards to protect its profits. The scale-leading platform can appropriately increase rewards, whereas a smaller platform should minimize rewards to ensure profit growth.

This study systematically analyzes the mechanisms and effects of group-buying strategies in social commerce, addressing critical gaps in the integration of pricing, group size, and leader rewards under both monopoly and competitive conditions. The findings reveal that the effectiveness of group buying is highly sensitive to market characteristics (e.g., potential market size and unit convincing cost), social relationship strength, and competitive dynamics. Specifically, larger group sizes amplify profits only when supported by sufficient market demand and low convincing costs, whereas leader rewards must align with users' reward sensitivity and social ties to avoid inefficiencies. The cross-price impact coefficient ($\sigma$) dictates strategic interdependence; complementary scale adjustments thrive in low-$\sigma$ environments, whereas coordinated actions are superior in high-$\sigma$ scenarios. Success hinges on the real-time monitoring of competitors' scale and reward levels, enabling adaptive strategies, such as aggressive rewards for scale leaders and caution for smaller platforms. These insights underscore the need for a holistic, data-driven approach in which platforms continuously calibrate group sizes and rewards on the basis of market diagnostics, social relationship assessments, and competitive intelligence. By embedding these principles into operational frameworks, social commerce platforms can transform group buying from a tactical tool to a sustained competitive advantage.

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