

Turning Social Capital into Economic Capital: the Sales Effect of Friendship Group Participation in Social Commerce Websites

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Abstract

Friendship groups have been widely adopted in social commerce platforms because of the powerful and pervasive influence of groups on decision making. Despite their widespread use, the sales effects of seller participation in friendship groups (FGP) have received limited research attention. Using a quasi-experimental design with 373,964 products from 8,250 sellers on a leading social commerce platform, we find that FGP increase sellers' product sales performance through the formation of relational and cognitive capital. In addition, we find that seller guarantee, product guarantee and product rating strengthen the sales effect of FGP, while the number of seller followers weakens the sales effect of FGP. Our study contributes to the literature by examining how, why, and when FGP affect sales performance in social commerce. We also provides guidance for sellers and platforms to use friendship groups and group marketing to improve sales performance in social commerce.

Keywords: Social commerce, Group marketing, Social capital theory, Quasi-experiment, Difference-in-difference

1. Introduction

Social commerce is an emerging trend in which sellers and customers connect in online social networks and conduct business through seller-customer social interactions. (Gao et al., 2022). In social commerce community, friendship groups and group marketing are growing in number and size. In general, friendship groups are groups of members or social categories with similar interests and common goals embedded in a larger virtual community. (Tsai & Bagozzi, 2014). Friendship group utilizes the merits of group marketing which focuses on using the psycho-social mechanisms underlying group influence to establish the seller-customer relationships and drive customer behaviors

that are beneficial to firms (Harmeling et al., 2017). Wang et al. (2021) highlights that over one billion users use the social media platform Facebook to organize in groups, offering firms and sellers more visibility and access to target customers. Therefore, it is of great importance to examine whether and how social commerce platform providers and sellers can leverage friendship groups to achieve favorable business outcomes.

Although existing studies have explored the different functions of platform governance strategies in relation to individuals (e.g., social media tools, user-generated images, and social nudge systems) in social commerce, group-level governance functions have been largely overlooked. For instance, the extant social commerce literature has examined the impact of social and peer influence on customer social shopping behaviors, the impact of social pricing, social sharing, and advertising strategies on seller performance, as well as the launch of platform governance functions to govern customer behavior and seller performance (Gao et al., 2022; Rhue & Sundararajan, 2019; Sun et al., 2012). In fact, with the implementation of friendship group function, sellers can participate in their interested friendship group and utilize the group-level governance function to develop personal relationship and social ties with target customers, build their social capital, and improve their sales performance.

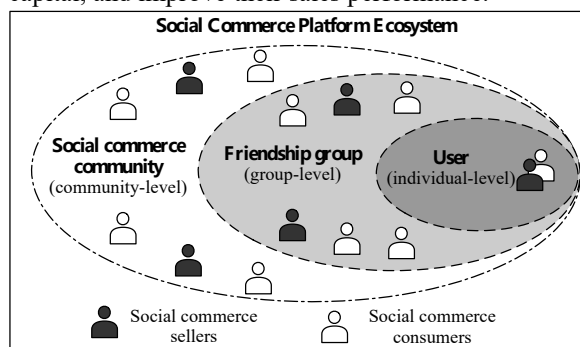


Figure 1. Friendship group in social commerce

As shown in Figure 1, friendship groups are prevalent significant influence on ingroup members' beliefs and behaviors. The launched of friendship group function can increase customers' awareness of their affiliation to the focal group and exposure to group norms within the group. As an effective way of bridging structural holes in online social networks and a manifestation of structural capital, sellers' friendship group participation (FGP) can help them develop personal connections and network ties with target customers in the focal friendship group. Such structural capital may bring sellers with favorable business outcomes such as increased sales performance through the gradually formed relational capital (e.g., identification, trust, and reciprocity) and cognitive capital (e.g., shared language and domain-specific knowledge) in friendship groups. Thus, the primary goal of our study is explore how, why, and when sellers' FGP influence sales performance. Specifically, we have three research questions: (1) *What's the sales effect of FGP in social commerce?* (2) *What's the underlying mechanisms behind the sales effect of FGP?* (3) *How do product- and seller-heterogeneity influence the sales effect of FGP?*

We designed a quasi-experiment setting using a novel data set from a leading social commerce platform (i.e., Weidian.com) and its integrated friendship group function (i.e., Quanzi) to establish the casual effect of FGP on sales performance. The data set involves a 12-months panel data from 373,964 products from 8,250 sellers from October 2020 to November 2021 (6-months before and after the launched of Quanzi function in Weidian). To address the endogeneity and self-selection issues, we used a difference-in-difference (DiD) method with propensity score matching (PSM) to quantify the sales effect of FGP.

Overall, our results showed that sellers' FGP leads to an increase in sellers' sales performance for their products. Moreover, our mechanism tests indicated that the positive sales effect of FGP can be attributed to the relational capital and cognitive capital effects. Additionally, our heterogeneity analyses revealed that the positive sales effect of FGP is higher for sellers with promised seller guarantee and products with promised product guarantee and positive product rating, while it is lower for sellers with a small number of followers.

2. Theory and hypotheses

2.1. Social commerce

Social commerce is a combination of social and commercial interactions which allows individuals to

participate actively in the marketing and selling of products through social media activities and tools (Lee et al., 2015). Social commerce has received intensive attention with three research streams: (1) consumer behavior; (2) seller performance; and (3) platform governance. The *consumer behavior* stream investigates the social influence and (Dewan et al., 2017) peer influence (Rhue and Sundararajan, 2019) on the formation of customers' social shopping behaviors, as well as how customer participation in a firm's social media increases visit frequency (Rishika et al., 2013). The *seller performance* stream examines how seller's sales performance can be influenced by social pricing (Gao et al., 2022), advertising strategies (Sun et al., 2012), and social sharing (Lee et al., 2015). The *platform governance* stream investigates how the efforts of platform providers' efforts in launching social nudge system (Wang et al., 2018), user-generated images (Guan et al., 2023), and social media tools (Ren et al., 2023) influence product ratings and sales.

Our study is closely related to the platform governance stream which focuses on the efforts of platform providers in launching governance functions to guide consumer behaviors and boost seller performance. The existing literature has examined the sales effect of individual-level governance functions, with a primary focus on social media tools (Ren et al., 2023), user-generated images (Guan et al., 2023), and social nudge system (Wang et al., 2018). However, limited attention has been paid to the sales effect of group-level governance functions (i.e., friendship group function) which attempt to leverage the psychological mechanisms underlying group influence to driver customer behaviors and boost sellers' performance in social commerce community.

2.2. Group marketing

Group marketing is to use the psychological mechanism behind group influence to promote the customer and seller behaviors that are beneficial to firms and platforms (Harmeling et al., 2017). The extant group marketing literature can be divided into two streams: (1) characteristics and antecedents of group marketing and (2) impacts and outcomes of group marketing. In the first stream, researchers investigates the *characteristics and antecedents of group marketing* pertaining to how friendship group member behavior is influenced by strangers versus friends (Lee et al., 2015), subordinates versus superordinates (Mu et al., 2018), and direct versus indirect peer influence (Zhang et al., 2018). In the second stream, ample studies examines the influence of group marketing, showing that friendship group can

increase customers' visit frequency and self-reported attachment (Ren et al., 2012), boost customers' voluntary contribution (Tsai & Bagozzi, 2014), and motivate customers' preference expression (Rishika & Ramaprasad, 2019).

Our study is highly relevant to the research stream on the impacts and outcomes of group marketing. Prior studies have widely examined the beneficial economic and societal outcomes of customers' participation in friendship group, such as visit frequency, voluntary contribution, and preference expression (Ren et al., 2012; Tsai & Bagozzi, 2014). However, these studies have largely overlooked the impacts and outcomes of sellers' participation in friendship groups. Our study thus examined how, why, and when sellers' FGP affects sales performance for their products, an important economic outcome in social commerce.

2.3. Social capital theory

Social capital refers to a set of resources embedded within the social relationships among actors within a social network (Robert et al., 2008). Unlike the physical capital embodied in physical objects and the human capital invested in humans, social capital captures the relational resources that are deeply rooted in the ongoing relationships between actors with a social networks that facilitates the various social interactions and collective actions between actors (Collins & Smith, 2006). Social capital theory has been widely employed to investigate the formation of knowledge contribution (Wasko & Faraj, 2005; Huang et al., 2019), team collaboration (Faraj et al., 2015; Collins & Smith, 2006), and business success (Sun et al., 2012).

According to Nahapiet & Ghoshal (1998), social capital consists of structural, relational, and cognitive dimensions through which collective actions between actors can be promoted in social networks (Granovetter, 1973). Structural capital refers to the impersonal configuration of social relationships, representing the network ties and configuration and through which actors reach others and when and how others reach them (Rau et al., 2008). Relational capital represents the social assets that are created and leveraged through social relationships, such as trust, respect, norms, obligations, and identifications (Nahapiet & Ghoshal, 1998). Finally, cognitive capital captures the resources that promote shared language mutual understanding between actors, which enables effective domain-specific communications and social interactions (Huang et al., 2019).

2.4. The Sales effect of FGP

Social capital theory suggests that structural, relational, and cognitive capital are three basic elements of social capital (Nahapiet & Ghoshal, 1998). Although these three dimensions each represent a distinct facet of social capital, recent studies have posited that structural capital positively influence relational and cognitive capital because it provides initial network accesses and ties to resources. The effect of structural capital on the exchange and combination of information is derived directly and indirectly through the development of relational and cognitive dimensions of social capital. An an effective way and a type of structural capital in social commerce community, FGP may demonstrate a positive effect on sellers' sales performance for their products through the development of relational and cognitive capital.

On the one hand, FGP is an effective way to improve sellers' relational capital by expanding their personal connections and network ties with target consumers. Relational capital represents a strong emotional bonding and intimate relationship between sellers and consumers in friendship groups (Nahapiet & Ghoshal, 1998; Zhao et al., 2013). Friendship group creates a place where sellers and consumers with similar product interests can interact with each other with the affiliation to a focal group and the exposure to group norms. Through the participation in friendship group, consumers have more sense of identity with a seller in the process of interacting with the seller. Consumers will regard themselves as members of the friendship group and develop personal emotional commitment to the group and positive evaluation of the group, which ultimately reveals their supports for ingroup sellers' products by making purchase behaviors (Allen et al. 2018).

On the other hand, FGP can increase seller's cognitive capital through enabling shared knowledge and mutual understanding between sellers and consumers. Friendship group offers a place where group members' diverse information and perspectives are brought together and where new ideas and understandings are likely to emerge through social interactions (Nambisan & Baron, 2009). Social commerce sellers who participate in friendship groups are often at the center of communication flows and knowledge exchange (Wellman & Gulia, 1997). Moreover, sellers are able to post product promotions, product advertisements, and product purchase links which target consumers are interested in. These shared business knowledge and domain-specific information increase mutual understanding between sellers and consumers, thereby increasing the possibility of target

consumers in purchasing products from ingroup sellers. Collectively, we hypothesize that:

H1: *In social commerce platforms, FGP will increase sellers' sales performance for their products through the underlying (a) relational capital effect and (b) cognitive capital effect.*

3. Research method

3.1. Sample and data collection

We obtained our main dataset from Weidian, which is one of the most popular and widely used social commerce platform in China. Weidian was founded in 2011, and as of December 2022, it has over 8 million sellers who have used the platform to serve 4.5 billion customers from China (Weidian 2022). Similar to Poshmark, Weidian is based on Wechat and its characters is social function. On April 19, 2021, Weidian launched its own friendship group function called Quanzi, which allows community users (both sellers and buyers) with similar interests to voluntarily participate in to develop personal connections and social ties. The launch of Quanzi provides a quasi-natural experimental environment because it is possible to establish a treatment group composed of sellers who have joined at least one friendship group and a control group composed of sellers who have not joined any friendship group. We can infer the causal influence of

FGP on sales performance by comparing the sales differences of sellers in the control and treatment groups before and after the launched of Quanzi.

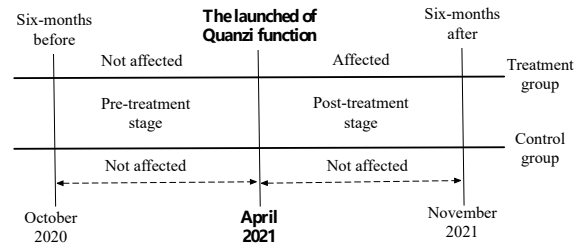


Figure 2. The timeline of quasi-experiment

We designed Python-based crawling procedure to obtain the ID of all Weidian sellers. Following sellers' ID, we obtained two categories of data: seller homepage and product homepage. Seller homepage include seller's basic information(e.g., LikesNum, SellerFollowers), seller's posts information (e.g., PostContent, Tag, Comment, CricleName, PostCount) and store's information(e.g., ShopName, ShopLocation, ShopCredit). Product homepage include product comment (e.g., CommentID, Buyerlevel, ProductType), product detailed information (e.g., Price, Coupons, ProductRating). Our final sample includes 12-months (6-months before and after the launched of Quanzi) panel data from October 2020 to November 2021 of 373,964 products from 8250 sellers, including 10,190 products from 285 sellers in treatment group and 374,496 products from 7,965 sellers in control group.

Table 1. Variables and descriptive statistics

Variables	Measures	Mean	S.D.
Dependent variable			
$SalesPerformance_{ijt}$	The sales performance of product i of seller j in month t .	0.32	4.87
Independent variable			
FGP_{ijt}	Whether product i 's seller j participate in Friendship Group in month t .	0.0066	0.08
Mediating variables			
$PostingLikes_{ijt}$	The number of posts' likes of product i 's seller j in month t .	1.29	42.58
$PurchaseLinks_{ijt}$	Whether product i 's seller j post in Friendship Group with product purchase link in month t .	0.086	0.28
Product-level control variables			
$ProductRating_{ijt}$	The good comment rate of seller j 's product i in month t .	0.05	0.22
$ProductGuarantee_{ijt}$	Whether the seller j 's product i provides transaction guarantee in month t .	0.97	0.14
$SevenDaysReturn_{ijt}$	Whether the seller j 's product i provide seven days for no reason to return in month t .	0.37	0.48
Seller-level control variables			
$SellerFollower_{ijt}$	The number of followers of product i 's seller j in month t .	1826.11	1065.49
$SellerCertification_{ijt}$	Whether the seller j of product i is certified in month t .	0.0082	0.09
$SellerGuarantee_{ijt}$	Whether the product i 's seller j provides service guarantee in month t .	0.13	0.34
$PaymentGuarantee_{ijt}$	Whether the product i 's seller j pay the security fund in month t .	0.17	0.38
$FGPUserNumber_{ijt}$	The users' number of Friendship group which the product i 's seller j participate in month t .	17923.3	78338.2

Note: Subscript i denote product, subscript j denote seller, subscript t denote time.

3.2. Variables and measures

3.2.1. Dependent variable. Our main dependent variable is $SalesPerformance_{ijt}$, which refers to the

sales of seller j 's product i in month t . We measured $SalesPerformance_{ijt}$ using the total number of monthly comments of product i of seller j in month t for two reasons. First, similar to many social commerce websites, the monthly product sales of Weidian platform is unobservable to public. Second, Weidian platform has a default favorable comment mechanism. That is, the platform will automatically generate a favorable comment to a product if a customer don't comment in one month after s/he purchased the product. Thus, the actual product sales can be calculated by the default favorable comments automatically generated by the platform, plus the number of comments actively published by the customers.

3.2.2. Independent variable. Our main independent variable is FGP_{ijt} , which captures whether the seller j of product i has participated in friendship group in month t after the launched of Quanzi function. FGP_{ijt} is a dummy variable which equals to 1 if a seller participate in friendship group, and 0 otherwise.

3.2.3. Control variables. Our main control variables are product- and seller-level characteristics that may affect sales performance in social commerce websites. Product-level control variables include $ProductRating_{ijt}$ (i.e., the rating of a product i of seller j in month t), $ProductGuarantee_{ijt}$ (i.e., Whether the seller j 's product i provides transaction guarantee in month t), and $SevenDaysReturn_{ijt}$ (i.e., whether a product i of seller j provides 7-days product return without reason policy in month t). Seller-level control variables consist of $SellerFollower_{ijt}$ (i.e., the number of followers of seller j in month t), $SellerCertification_{ijt}$ (i.e., whether seller j is certified in month t), $SellerGuarantee_{ijt}$ (i.e., whether seller j of product i promises to provide guarantee for service failure in month t), $PaymentGuarantee_{ijt}$ (i.e., whether seller j of product i has the security fund for service failure in month t), and $FGPUserNumber_{ijt}$ (i.e., the number of friendship group members of product i 's seller j in month t).

4. Empirical analysis and results

4.1. Main results

We employed a difference-in-difference (DiD) model to investigate the casual influence of FGP on sales performance. To address the concerns about the randomness assumption, we applied a propensity score matching (PSM) to ensure the comparability between the treated and control groups before DiD analyses.

Following the recent social commerce studies (Ren et al., 2023), we conducted PSM by sorting all

products randomly and running a logit regression to obtain the propensity scores based on the covariates among product- and seller-level observable characteristics. Then, we chose one-to-one nearest neighbor matching without replacement to match products. After PSM matching, we obtained 9488 products in the treatment group and 9488 products in the control group. Finally, we check the validity of PSM by conducting a balance check on the covariates in the treatment and control groups before and after matching. The two group covariates are quite balanced with no significant difference, thereby confirming the validity of PSM matching.

Our DiD estimation model is performed at the product-month level. The equation is provided as follows:

$$Salesperformance_{ijt} = \beta_0 + \beta_1 FGP_{ijt} + \lambda Control_{ijt} + \delta_i + \gamma_j + \eta_t + \varepsilon_{ijt} \quad (1)$$

Where $SalesPerformance_{ijt}$ represents the sales of product i in month t . FGP_{ijt} is a dummy variable that equals 1 if the seller j of product i has participated in friendship groups in month t and zero otherwise. $Controls_{ijt}$ are time-variant variables mentioned in Table 1. Product fixed effect δ_i captures the effect of unobserved time-invariant features of product i . Seller fixed effect γ_j captures the effect of unobserved time-invariant features of seller j . Time fixed effect η_t accounts for potential seasonality effects in product sales dynamics. To alleviate concerns about serial correlation issues, we allow for an arbitrary variance-covariance error structure within products over time by using clustered standard error in the estimation results.

Table 2. Main results

Variables	Salesperformance	
	(1)	(2)
<i>FGP</i>	0.142*** (0.064)	0.114*** (0.027)
<i>ProductRating</i>		6.361*** (0.009)
<i>ProductGuarantee</i>		0.072*** (0.015)
<i>SevenDaysReturn</i>		-0.028*** (0.004)
<i>SellerFollower</i>		-1.82 × e ⁻⁶ (0.000)
<i>SellerCertification</i>		0.249*** (0.013)
<i>SellerGuarantee</i>		-0.204*** (0.012)
<i>PaymentGuarantee</i>		0.131 (0.011)
<i>FGPUser</i>		-1.8 × e ⁻⁷ (0.000)
<i>Constant</i>	0.32*** (0.0004)	-0.066*** (0.016)
<i>Product FE</i>	YES	YES

<i>Seller FE</i>	YES	YES
<i>Month FE</i>	YES	YES
<i>Observations</i>	227712	227712
<i>R-squared</i>	0.15	0.18

Note. Robust standard errors in parentheses;
 $***p < 0.001$, $**p < 0.01$, $*p < 0.05$.

The estimation results are presented in Table 2 (column(1): without controls; column(2): with controls). The coefficients of FGP are significantly positive in column(1) and (2), indicating that the FGP have a positive effect on product’s sales performance.

4.2. Underlying mechanisms

Our main results show the casual effect of FGP on sellers’ sales performance for their products. We further analyzed the mechanisms underlying the sales effect of FGP: relational capital effect and cognitive capital effect. On the one hand, through participating in friendship groups, sellers can develop personal connections and social ties with other community members, which is a form of social capital in boosting their sales performance. On the other hand, the underlying mechanism of FGP is that seller can has ability to understand buyer’s needs, and post with the product link to meet the needs of buyers in a specific friendship group.

4.2.1. Relational capital effect. Weidian have launched the Quanzi function to promote the communication between buyers and sellers. The networks of relationships can facilitate collective action for the creation of benefits for the participant (Chen et al., 2019). Therefore, FGP can also enhance seller’s relational capital, thus improving the sales performance of the product. According to Lee et al. (2015), we use the likes rate as the proxy variable of relational capital. We estimated the role of likes rate(*PostingLikes_{ijt}*) in regression equation(2) and (3):

$$PostingLikes_{ijt} = \beta_0 + \beta_1 FGP_{ijt} + \lambda Control_{ijt} + \delta_i + \gamma_j + \eta_t + \varepsilon_{ijt} \quad (2)$$

$$Salesperformance_{ijt} = \beta_0 + \beta_1 FGP_{ijt} + \beta_2 PostingLikes_{ijt} + \lambda Control_{ijt} + \delta_i + \gamma_j + \eta_t + \varepsilon_{ijt} \quad (3)$$

Where *PostingLikes_{ijt}* refers to the number of posts’ likes of product *i*’s seller *j* in month *t*. The coefficient of *FGP_{ijt}* and *PostingLikes_{ijt}* both are positive in column(1) and (3) of Table 3, which means that seller participate in friendship group can increase *PostingLikes*, and high *PostingLikes* can increase *salesperformance*. In other words, FGP can indeed improve seller’s relational capital and thus increase sales performance.

Table 3. Underlying mechanism analysis

Variables	<i>Posting</i>	<i>Purchas</i>	<i>SalesPerformance</i>
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	<i>Likes</i>		<i>-eLinks</i>	
	(1)	(2)	(3)	(4)
<i>FGP</i>	0.12 *** (0.003)	0.26 *** (0.0015)	0.14 *** (0.031)	0.167 *** (0.031)
<i>Posting-Likes</i>			0.0009 *** (0.000)	
<i>Purchase-Links</i>				0.048 *** (0.01)
<i>Controls</i>	YES	YES	YES	YES
Product FE	YES	YES	YES	YES
Seller FE	YES	YES	YES	YES
Month FE	YES	YES	YES	YES
Observations	227712	227712	227712	227712
<i>R-squared</i>	0.044	0.045	0.044	0.044

Note. Robust standard errors in parentheses;
 $***p < 0.001$, $**p < 0.01$, $*p < 0.05$.

4.2.2. Cognitive capital effect. Another mechanism that may exist is that seller participate in friendship group can improve seller’s cognitive capital. Cognitive social capital represents “shared representations, interpretations, and systems of meaning among parties” (Nahapiet & Ghoshal, 1998). Shared language among group members allows for a sense of familiarity, which can foster trust among them (Karahanna & Preston, 2013). Seller post with product links(i.e., using shared language) increases transparency and meet the needs of buyers. We use the *PurchaseLinks* as the proxy variable of cognitive capital. We estimated the role of *PurchaseLinks_{ijt}* in regression equation(4) and (5):

$$PurchaseLinks_{ijt} = \beta_0 + \beta_1 FGP_{ijt} + \lambda Control_{ijt} + \delta_i + \gamma_j + \eta_t + \varepsilon_{ijt} \quad (4)$$

$$Salesperformance_{ijt} = \beta_0 + \beta_1 FGP_{ijt} + \beta_2 PurchaseLinks_{ijt} + \lambda Control_{ijt} + \delta_i + \gamma_j + \eta_t + \varepsilon_{ijt} \quad (5)$$

Where *PurchaseLinks_{ijt}* is a dummy variable indicating whether product *i*’s seller *j* post in friendship group with product purchase links in month *t*. The coefficients of *FGP_{ijt}* and *PurchaseLinks_{ijt}* are significantly positive in column (2) and (4) of Table 3. In other words, *FGP* can indeed improve seller’s cognitive capital and thus increase sales performance.

4.3. Heterogeneous analysis

Our main results and mechanism tests show that FGP demonstrates an overall positive effect on sales performance through the underlying relational and cognitive capital effects. In this section, we further conducted a series of heterogeneity analyses to explore what kind of product and seller characteristics can strength or weaken the positive sales effect of FGP.

4.3.1. Product-level heterogeneity. We conducted product-level heterogeneous analyses in terms of product rating ($ProductRating_{ijt}$) and product guarantee ($ProductGuarantee_{ijt}$). *Product rating* is a key indicator to measure the quality of products, as a reference point to evaluate product quality through product reviews (Wang et al., 2021). The specific form of product rating in Weidian is the percentage rating of the product after the customer buys the product. *ProductGuarantee* is a key indicator to measure the trust of product (Huang et al., 2021). The specific form of product guarantee in Weidian is the medal on the front page of the shop. We estimated the moderating effect of the product-level ($ProductRating_{ijt}$ and $ProductGuarantee_{ijt}$) in regression equation(6) and (7):

$$Salesperformance_{ijt} = \beta_0 + \beta_1 FGP_{ijt} + \beta_2 FGP_{ijt} \times productRating_{ijt} + \lambda Control_{ijt} + \delta_i + \gamma_j + \eta_t + \varepsilon_{ijt} \quad (6)$$

$$Salesperformance_{ijt} = \beta_0 + \beta_1 FGP_{ijt} + \beta_2 FGP_{ijt} \times productGuarantee_{ijt} + \lambda Control_{ijt} + \delta_i + \gamma_j + \eta_t + \varepsilon_{ijt} \quad (7)$$

Where the $ProductRating_{ijt}$ is the good comment rate of seller j 's product i in month t , the $ProductGuarantee_{ijt}$ is a dummy variable indicating whether seller j 's product i provides transaction guarantee in month t . As shown in column (1) of Table 4, the coefficient of the interaction term ($FGP_{ijt} \times ProductRating_{ijt}$) is significant positive, which means that the positive impact of FGP on sales performance is strengthen when the product rating is high. In other words, sellers with high *ProductRating* are more positively affected by FGP. In column (2) of Table 4, we find that the coefficient of the interaction term ($FGP_{ijt} \times ProductGuarantee_{ijt}$) is significant positive, which suggests that compared with products without guarantee, there is a more positive impact of FGP on sales for product with guarantee.

Table 4. Heterogeneous effect analysis

Variables	SalesPerformance			
	(1)	(2)	(3)	(4)
<i>FGP</i>	-0.042 (0.032)	0.280 (0.034)	0.118*** (0.033)	0.352*** (0.061)
<i>FGP</i> × <i>ProductRating</i>	2.19*** (0.098)			
<i>FGP</i> × <i>ProductGuarantee</i>		0.744*** (0.094)		
<i>FGP</i> × <i>SellerGuarantee</i>			0.198* (0.094)	
<i>FGP</i> × <i>SellerFollower</i>				-0.0008*** (0.0002)
<i>Controls</i>	YES	YES	YES	YES
Product FE	YES	YES	YES	YES
Seller FE	YES	YES	YES	YES
Month FE	YES	YES	YES	YES
Observations	227712	227712	227712	227712
<i>R-squared</i>	0.044	0.044	0.044	0.044

Note. Robust standard errors in parentheses;

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

4.3.2. Seller-level heterogeneity. We performed seller-level heterogeneous analyses pertaining to seller guarantee ($SellerGuarantee_{ijt}$) and friendship group user number ($SellerFollower_{ijt}$). Seller guarantee is a key indicator to measure the trust of seller (Jian et al., 2018), and seller follower is defined as the number of fans and followers of a seller (Ren et al., 2023). We investigated the moderating effect of the seller-level ($SellerGuarantee_{ijt}$ and $SellerFollower_{ijt}$) in Equation (8) and (9):

$$Salesperformance_{ijt} = \beta_0 + \beta_1 FGP_{ijt} + \beta_2 FGP_{ijt} \times SellerGuarantee_{ijt} + \lambda Control_{ijt} + \delta_i + \gamma_j + \eta_t + \varepsilon_{ijt} \quad (8)$$

$$Salesperformance_{ijt} = \beta_0 + \beta_1 FGP_{ijt} + \beta_2 FGP_{ijt} \times SellerFollower_{ijt} + \lambda Control_{ijt} + \delta_i + \gamma_j + \eta_t + \varepsilon_{ijt} \quad (9)$$

Where the $SellerGuarantee_{ijt}$ is a dummy variable indicating whether the product i 's seller j provides service guarantee in month t ; the $SellerFollower_{ijt}$ is the number of followers of product i 's seller j in month t .

As shown in column (3) of Table 4, the coefficient of the interaction term ($FGP_{ijt} \times SellerGuarantee_{ijt}$) is significant positive, which means that compared with seller without guarantee, there is a more positive impact of FGP on sales for seller with guarantee. We also find that the coefficient of the interaction term ($FGP_{ijt} \times SellerFollower_{ijt}$) is significant negative in column (4) in Table 4, which means that the treatment group with more seller followers, FGP have a less positive impact on sales performance.

4.4. Placebo test

We conducted a series of placebo tests to make sure our DiD analysis is credible. More specifically, we removed the post-treatment periods and set place events (two months, three months, and four months prior to the actual treatment event for each product). We used this new sample to estimate the DiD models. The result in Table 5 show that the coefficients of FGP_{ijt} are not significant across all columns, which suggests the validity of our causal estimates.

Table 5. Placebo test

Variables	SalesPerformance		
	2-months prior to the treatment event	3-months prior to the treatment event	4-months prior to the treatment event
	(1)	(2)	(3)
<i>FGP</i>	0.060 (0.033)	0.058 (0.041)	0.060 (0.033)
<i>Controls</i>	YES	YES	YES
Product FE	YES	YES	YES
Seller FE	YES	YES	YES
Month FE	YES	YES	YES
Observations	113,856	113,856	113,856
R-squared	0.032	0.032	0.032

Note. Robust standard errors in parentheses;
*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

4.5. Parallel trend assumption

The validity of the DiD model relies on a key assumption: that the treatment group and control group have similar trends before the treatment. We used a relative time model (Khurana et al., 2019; Mayya et al., 2021) to check this parallel trend assumption. We normalized time periods that assign negative integers to the pre-treatment time and positive integers to the post-treatment time. We created a series of time dummy variables, and the equation is specified as follows:

$$Salesperformance_{ijt} = \beta_0 + \sum_{h=1}^m \beta_h pre_{ijt}(h) \times Treatment_{ij} + \sum_{k=0}^n \alpha_k FGP_{ijt}(k) \times Treatment_{ij} + \lambda Control_{ijt} + \delta_{ij} + \eta_t + \varepsilon_{ijt} \quad (10)$$

where $Pre_{ijt}(h)$ is a dummy variable indicating whether period t is in the h^{th} pre-treatment period for product i of seller j and $FGP_{ijt}(k)$ is a dummy variable indicating whether period t is in the k^{th} post-treatment period for product i of seller j . For example, $FGP_{ijt}(1) \times Treatment_{ij}$ takes the value of 1 if period t is in the second post-treatment period after product i 's seller j participated in Friendship group and 0 otherwise. We set $m = 3$ and $n = 3$ to inspect the trends from three months before the treatment and three months after the treatment.

Figure 3 shows the treatment effects and their 95% confidence intervals in the pre- and post-treatment periods. We can see that all of the pre-treatment coefficients are insignificant, suggesting that the parallel trend assumption is satisfied. In the fourth post-treatment period, the coefficient of the treatment effect is insignificant, suggesting that the effect on sales performance in the month in which the product's seller participated in friendship group is short-term effect. Besides the fourth post-treatment, other post-treatments' coefficients are positively significant, indicating the positive impact of FGP.

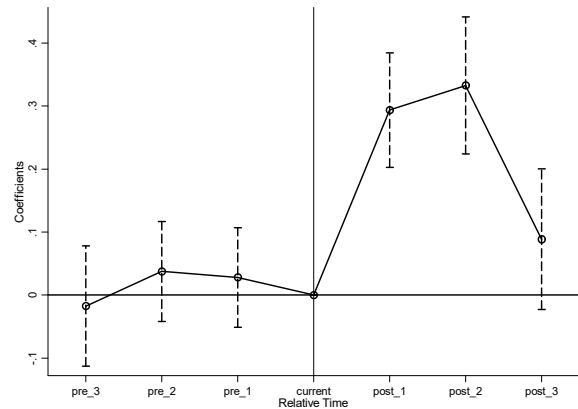


Figure 3. Pre-treatment trends and dynamic effect of FGP

4.6. Additional robustness checks

We conducted several additional robustness checks. First, we note that our sample was generated from the PSM method. We reestimated the DiD model as in Equation (1) using all products from full sample. The result is shown in column(1) of Table 6 and is consistent with our main findings. Second, we use alternative time window to conduct our analysis (3-

months before and after the launched of Quanzi). We obtained consistent results, shown in column (2) of Table 6. Third, we added some control variables in Equation (1), Column (3) of Table 6 reports the regression results, which is similar to our initial findings. All three additional robustness checks further illustrate the validity of our results.

Table 6. Additional robustness check

Variables	<i>SalesPerformance</i>		
	(1) DiD using all products	(2) Alternative samples	(3) Alternative controls
<i>FGP</i>	0.375*** (0.066)	0.145*** (0.054)	0.142* (0.062)
<i>Controls</i>	YES	YES	YES
Product FE	YES	YES	YES
Seller FE	YES	YES	YES
Month FE	YES	YES	YES
Observations	4,609,848	132,832	227,712
R-squared	0.218	0.085	0.044

Note. Robust standard errors in parentheses;
*** $p < 0.001$, * $p < 0.05$.

5. Conclusion and discussion

Our study examines the sales effects of FGP in social commerce, addressing a gap in the social commerce literature that lacks research on group-level governance functions. Using a quasi-experimental design with a 12-month panel of 373,964 products from 8,250 sellers, we find that the overall sales effect of FGP is positive. Our parallel trend test, placebo test, and a series of additional robustness tests provide consistent findings for inference of chance. In addition, our mechanism tests suggest that the positive sales effect of FGP is established through underlying relational and cognitive capital effects. Finally, our heterogeneity analysis suggests that seller guarantees, product guarantees, and product ratings enhance the sales effect of the FGP, while the number of seller followers weakens the sales effect of the FGP.

This study has several theoretical contributions. First, our work contributes to the social commerce literature by validating the causal, the underlying mechanisms, and boundary conditions of the sales effects of FGP. By doing so, our study shifts the focus of current research from the individual level in social commerce platform design to the group level governance function. Second, prior group marketing research has focused on the psychological mechanisms of group influence to leverage the beneficial effects and outcomes of customer engagement behaviors. Our work advances the group marketing literature by highlighting the economic outcomes and impact of sellers' active participation in friendship groups. Third, our work confirms that FGP are an important structural

capital with the ability to help sellers build their relational and cognitive capital, which validates the interrelationship of the three dimensions of social capital in social business communities. Our work also tests boundary conditions in social capital theory related to product- and seller-level characteristics in social business communities.

Our study has several practical implications. First, social commerce sellers should intentionally and actively participate in friendship groups to establish their relational and cognitive capitals and turn these social capital to economic capital, especially for those sellers who offer seller guarantee and product guarantee with a high level of product rating and a small number of followers in social commerce community. Second, social commerce platform providers should strategically design group-level governance functions and utilize the group influence mechanisms to driver customer behavior and promote sellers' performance.

This study is subject to several limitations. First, our work only focused on the sales effect of FGP. Future work can explore other business outcomes, such as customer satisfaction and repurchase. Second, future research can extend our heterogeneity analyses by focusing other types of product- and seller-level characteristics, such as product price and seller reputation. Third, our work merely examined the group-level governance functions of friendship group. For generalizability, future work can consider other group-level governance functions, such as fans group.

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