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Strategies of state penetration: a network analysis of community governance in Shanghai

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Introduction: The Chinese state has been found to penetrate community participation to strengthen state infrastructure power, but understanding of these strategies remains equivocal.

Methods: This paper collect complete network data from a sample of 112 residents who were active in community activities in Kang community in Shanghai, China. Kang is an award-winning community for its active participation and excellent governance. We examine the strategies of state penetration on the relation between residents' committee (RC) and the thick network through routine community activities.

Results: The network is indeed horizontal (rather than hierarchical) around the RC. Instead of manifesting state power, popularity within the network translates to decision-making power in deciding routine community activities. However, residents with high network popularity are affiliated with the state, and this association may be generated by the state itself through a deliberate process of cultivation and co-optation.

Discussion: These findings shed light on the nuanced strategies of state penetration. Rather than overt suppression or infiltration, the state exerts authority over a horizontal network, which ensures that self-organized community participation occurs under state domination.

KEYWORDS

community governance, community network, community participation, social network analysis, urban China

Introduction

Community participation—a form of civil society at the grassroots level—is generally believed to cultivate civic virtues, unite citizens to voice concerns, and promote state accountability (Putnam et al., 1993; Fung, 2003). Under authoritarian regimes, however, community participation may not challenge but rather enhance a state's legitimacy and ability to rule (Giersdorf and Croissant, 2011; Tomba, 2014). For example, the Chinese state has incrementally wielding "community self-governance" (Heberer, 2009; Heberer and Göbel, 2011), by incorporating community participation to enhance infrastructure power and the state's ability to rule (Bray, 2006; Tomba, 2014; Lu and Shi, 2015). However, scholars have found that the degree of "self" part can vary in community self-governance: from "democratic localism" (Wang et al., 2018) to "multipurpose partners" (Luova, 2011) to "symbolic governance" (Chen et al., 2023). Then, it begs the question: In community self-governance, who prevails state–society relations? More specifically, this study seeks to identify the strategies through which the state penetrates authority over self-organized community participation to achieve effective community governance.

The community network, especially the strong ties that entail reciprocity and obligation, has been identified as a key mechanism for effective community governance. As explicitly stated in Benjamin Read's administrative grassroots engagement (AGE) framework, "[S]tates

create, sponsor, and manage networks of organizations at the most local levels that facilitate governance and policing by building personal relationships with members of society" (Read, 2012, p. 3–4). The AGE framework identifies two community network types—thick and thin—in daily community governance practice. The vast majority of residents belong to the thin network, who have little enthusiasm for community participation or do not participate at all. Only a small fraction of residents belong to the thick network. They regularly participate in community activities, and some are state affiliated and mobilized by the RC to carry out administrative tasks (Read, 2012). Thus, understanding the relationship between the RC and the thick network can illuminate the mechanisms through which the state harnesses community forces to perform better and gain legitimacy at the grassroots level.

Following Read's AGE framework, this study proposes a network analysis to disentangle the state's penetrating strategies in community governance. Although existing evidence has emphasized the relational aspect of community governance (i.e., the relationship of the RC and the thick network), most research has been from the RC's perspective, focusing on topics such as its functions, constitutions, and working methods (e.g., Read, 2000, 2012; Bray, 2006; Heberer and Göbel, 2011; Tomba, 2014). The literature on the relationship *per se* has remained relatively mute. As network analysis examines power and authority not as an attribute but as a relationship (Gould, 1993), it offers measurable structural properties of the relational aspect of community governance (e.g., the network structure between the RC and members of the thick network), suggesting the interaction between state and society at the community level.

This study attempts to follow the AGE framework and analyze the network structure on one Shanghai community, Kang. Kang is a gated residential complex in which all apartments were sold on the housing market. That said, most residents did not know each other before moving in thus the observed community network is established by daily interactions. Of particular importance for our study, Kang is an award-winning community for its active participation and excellent governance. The Kang's RC has won several awards for its excellence in management efficiency and cultivation of harmony. The Kang's Party secretary has recently been awarded the top prize for excellent grassroots Party building. Thus, Kang's community governance presents a model of state-recommended community governance.

This study seeks to contribute to two areas of scholarship in the field of comparative governance. First, we provide an analytical lens to explore the strategies through which the Chinese state uses to harness social forces in urban communities. Most research in this area is qualitative. These studies offer rich details about the constant struggle and negotiations between state actors, non-state actors, and ordinary residents (e.g., Shi and Cai, 2006; Fu and Lin, 2014; Cai and He, 2021), but these data cannot capture the power-sharing between different actors at the community level and make comparisons across cases. While some research enlists a quantitative network perspective, it often uses either value measures, such as community attachment or solidarity (Hazelzet and Wissink, 2012; Zhu, 2022), or ego-centric network measures on single residents (Fu et al., 2015). We argue a quantitative assessment of community networks can reveal the ways and to what extent the state exerts its authority in community governance. This study is one of the first attempts in this direction.

Second, this study contributes to the understanding the state-society relationship at the grassroots level in the authoritarian regime. The current literature suggests the authoritarian state does not necessarily eliminate social forces but can shape or harness them to enhance its authority at the grassroots level (Lewis, 2013; Klein and Lee, 2019). In fact, the state can employ various strategies of penetration in community life, such infiltration, cultivation, and co-optation, to enhance political control (Mattingly, 2019). The recent calls for volunteering and the efforts for grassroots-level Party building in Chinese cities indicate the Chinese state and Chinese Communist Party may use various penetrating strategies at the grassroots level (Kan and Ku, 2021; Qin and Owen, 2021). Consist with this line of research, we attempt to quantify and distinguish different state penetrating strategies to produce both participation and compliance.

The rest of the paper is organized as follows. We first offer a review of the Chinese urban community building campaigns, the AGE framework, and the relevant literature on community governance in urban China. We then translate the AGE framework into three testable network hypotheses and examine them with the network data of all members of the thick network in the Kang community. Finally, we present some qualitative evidence on the conscious process of state cultivation and co-optation—a penetrating process. Our research explicates nuanced penetrating strategies at the urban grassroots level, in which the state wields informal networks to self-organize and at the same time enhances its ability to rule.

Literature review

Urban community governance: the RC and the thick network

Since the 2000s, China's state has launched several community-building (*shequ jianshe* 社区建设) campaigns to consolidate infrastructure power at the grassroots level. These campaigns aim to enforce administrative control on urban communities. The government has delegated service provision responsibilities to local governments (i.e., street offices) and empowered the RC as the state intermediary at the community level (Read, 2000; Shieh and Friedmann, 2008). In the 2010s, the governing measures were intensified by the establishment of grid-based management system (*wanggehua guanli* 网格化管理) (Mittelstaedt, 2022) and building Party cells and designating community Party secretaries (*shequ zhibu shuji* 社区支部书记) as the *de facto* leaders of the community (Gore, 2010; Kan and Ku, 2021).

However, these campaigns also encourage community participation and leave some room for self-organization. Homeowners' associations (*yezhu weiyuanhui* 业主委员会, HA hereafter), elective bodies formed to advocate residents' property rights, acquired legal status and proliferated in the late 2000s (Fu and Lin, 2014). In a typical urban community in China, the RC, the HA, and the community Party branch compose a managing body that works with residents to form a type of community governance that "manages its own affairs within the operational parameters established by government authorities" (Bray, 2006, p. 543). As such, ordinary residents often see community participation as self-organized and not necessarily

adhering to the state agenda (Luova, 2011; Wang et al., 2018; Chen and Tian, 2023).

In the AGE framework, Read suggests that the state and society are not separate but intertwined at the community level and puts it, "vertical power need not to actively smash horizontal solidarity; it can displace or preempt it in more subtle ways" (Read, 2012, p. 268). Read points out that the RC and the thick network are key to understanding how the state penetrates community participation in urban China (Read, 2012). From within the thick network, the RC recruits a group of state-affiliated residents as volunteers for assistance, including three types: block captains (*louzuzhang* 楼组长) to maintain stability, volunteer groups (*zhiyuanzhe duiwu* 志愿者队伍) to provide service, and Party members to serve as the reservoir for volunteers ready to be called upon.

Read further highlights the relational aspect of community governance, as the RC relies on community ties to achieve residents' compliance and cooperation (Read, 2012). First, the RC's connection with the thick network largely determines whether the RC can motivate the thick network to contribute to regular governance (Chen et al., 2023). Second, the relationships between residents of the thick network can affect the quality of community governance. The residents can work together if they form a cohesive network, but that ability is impaired or even impossible if the network is fragmented or conflict exists (Chen and Lu, 2009). Thus, the relationship between RC and the thick network influences whether the state can effectively deploy community ties in community governance. These community ties can be used by residents to voice collective interests (Tomba, 2005; Shi and Cai, 2006; Xu and Lin, 2019), but they can also be used by the RC to mute disputes and dissent (Deng and O'Brien, 2013).

Network analyses of the state's penetrating strategies

We use the network approach to analyze the relationship between the RC and the thick network to reveal the state's strategies to penetrate community decision-making. According to the pioneering work of Baldassarri and Diani (2007) on British civic networks, examining community networks requires consideration of the structural configurations and related relational dynamics. We thus identify two analytical dimensions: the network structure and the relative positions of the RC and the state-affiliated residents in the thick network. The network structure dimension measures the interdependence between the RC and the thick network, as well as the relationships among members of the thick network. The dimension of the relative network positions of the RC and state-affiliated residents measures how the thick network sees the power and influence of state affiliation in community issues. If the state penetrates the community thick network, we expect these dimensions to show patterns that differ from those found in other autonomous civic settings, which may further illuminate what strategies the state uses to penetrate community issues.

The dimension of network structure encompasses two distinct ideal network structures, as defined by Putnam et al. (1993). He proposes that civic engagement can form either a horizontal or a hierarchical network, depending on the tasks it aims to accomplish. Civic groups tend to form horizontal networks to enhance reciprocity, boost communication, and facilitate collaboration. In contrast, a hierarchical relationship indicates that civic groups prioritize implementing orders in an efficient manner. So, if the state can determine how the thick network is organized, it would pick the hierarchical form owing to its efficiency in delivering government commands. Thus, we propose that *if the state penetrates the thick network, it is likely to form a hierarchical rather than a horizontal network structure*.

The relative position of the RC and state-affiliated residents in the network identifies how residents see the RC's power and influence on the community. The question of power distribution in local community derives from the classic power elite debate, about whether the power is concentrated among a few individuals or is distributed among multiple groups (Domhoff, 2021). Similarly, the question about the position of community elites in local decision-making is at the center of the debate on the state-society relationship in China (Deng and O'Brien, 2013; Chen and Liu, 2021). We pick two classic measures from the power elite debate, namely, Hunter's measure of reputation and Dahl's measure of decision-making, and translate them into network measures.

We translate Hunter's measure of reputation (Hunter, 1969) into a measure of network popularity. Community reputation measures residents' account for who is influential in community decision-making. In the network term, an individual's network popularity determines their relative position in the network, with more central positions having a greater impact on others' views and decision-making (Feld, 1991). Thus, if the state wants to shape the community decision-making, the RC and the state-affiliated residents have to occupy central positions in the network in order to influence the other residents. Thus, *if the state penetrates the thick network, state affiliation (including RC) is positively associated with network popularity*.

We translate Dahl's decision-making (Dahl, 2005) into a measure of nominations for candidates who are responsible for implementing routine community activities. Dahl argues that the actual decision-making power lies with whoever decides events and meetings, which may differ from the individuals who are legally defined as powerful. In the democratic community settings, routine activities can be determined by a group of elected representatives who win residents' nomination through their relative influence over the community (Son and Lin, 2008); that is, network popularity tends to translate into decision-making power. However, when community decision-making is shaped by the state, the representatives are likely to show political loyalty and willingness to implement government instruction (Walder, 1986; Kornai, 1992). Thus, *if the state penetrates the thick network, state affiliation (including RC) is positively associated with decision-making power, regardless of network popularity*.

Data and methods

Study site: Kang community

Located in Shanghai, Kang is a gated community composed of 17 apartment buildings, over 800 households, and around 3,000 residents. The buildings were constructed between 2000 and

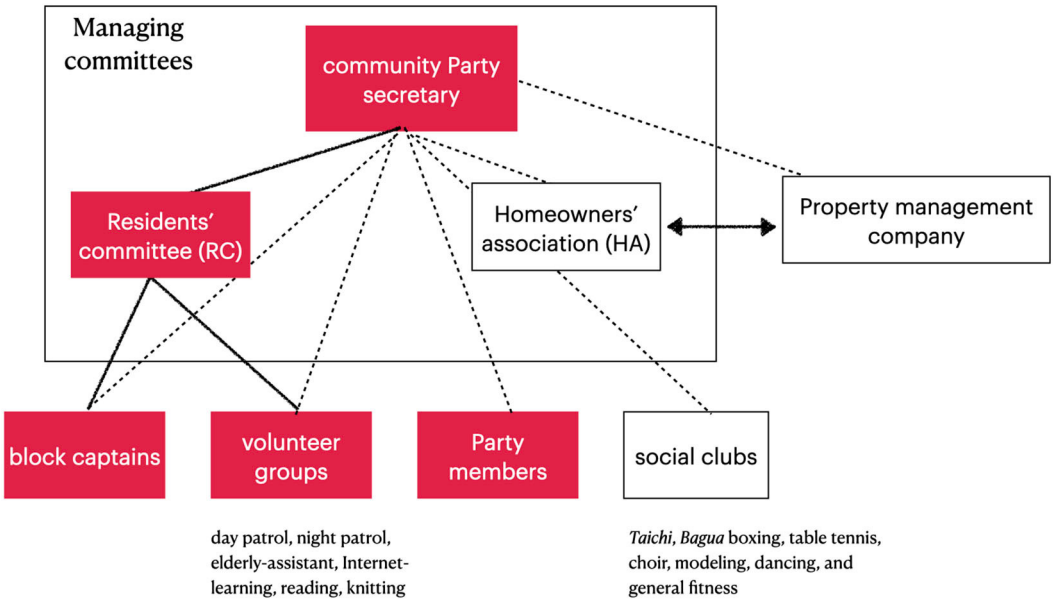

FIGURE 1
Formal management structure and state-affiliated mobilization chains, Kang community. Kang property management company does not involve in community daily decision-making. Shaded boxes indicate state affiliation. Solid lines: RC-block captains, RC-volunteer groups (RC mobilization). Dotted lines: Party Secretary-Party members (Party mobilization), including individual members ("Party members") and members within groups/organizations.

2002, and apartments were sold on the open real estate market. Kang is a middle-class community where most residents are local Shanghainese and stable homeowners with at least a high school education and are currently employed in or retired from white-collar jobs. The majority of residents did not know each other before moving to the community.

Like most gated communities in Shanghai, Kang is managed by one RC, one HA, and one community Party branch (Figure 1). The property management company is commercially oriented and is not involved in daily community management. The Party secretary also serves on the residents' committee. Although she is not the head of the RC, she is the *de facto* leader as both the heads of the RC and HA are Party members. The year before our study, the Party secretary successfully persuaded the HA head to change the HA election policy. One of the most outstanding one is: In future HA elections, Party membership is a recommended requirement for the HA head and three out of seven HA committee members have to be Party members.

In Kang, the RC recruits volunteers through three chains: block captains, volunteer groups, and active Party members. Among these chains, the block captains are perhaps the group working most closely with the RC; this group is responsible for daily maintenance and security and for reporting any concerns to the RC. They also serve as grid persons (*wanggeyuan* 网格员) in the government-defined grid system. Volunteer groups are service-oriented (*fuwu daoxiang* 服务导向) and include groups such as the neighborhood patrol team, the Internet-learning club, the reading club, the elderly-assistant team, and the knitting club. These volunteer groups receive funding as well as directions from the RC, and their members actively participate in the daily management of the community (*shequ richang guanli* 社区日常管理). Active Party members include Party members who register at Kang (*shequ baodao* 社区报到) and regularly participate in weekly community Party meetings.

Other members of the thick network mainly consist of regular participants in social clubs (*xiuxian yule tuanti* 休闲娱乐团体). They are mostly sports clubs or entertainment societies, including *Taichi*, *Bagua* boxing, table tennis, choir, modeling, and dancing. These social clubs need to register with the RC, but they do not receive funding from the RC and often are not involved in daily community management.

Sample

After receiving the ethical approval from (blinded for review), we identified and surveyed all residents who belong to the thick network from May to July 2019. The RC gave us the rosters of the RC, the HA, and block captains, and the Party secretary gave us the names of all active Party members. To obtain the name list of regular participants in volunteer groups and social clubs, we first asked the RC to provide the contact information of the head of each group/club and then consulted the head to compile the list. To ensure that the name roster is complete, we asked each respondent if they knew anyone who was active in the past year but not included on the roster. No additional names were identified. In total, we found 114 residents and surveyed 112.[1]

1 When we began data collection, one resident declined to participate because she was moving out of the community, and another was on vacation outside Shanghai at the time of survey.

Data collection

We conducted one-on-one, face-to-face surveys, either in a private room at the community center or in the respondent's home. Each survey took about 30–45 min. The interview consisted of three parts: (a) a survey about the respondent's basic demographic information, community attachment, and attitudes toward community management; (b) network data about closeness among residents on the name roster; and (c) three hypothetical scenarios on daily community management issues and invite respondents to nominate six candidates that would make decisions.

When collecting the network data, we presented each respondent with the complete name roster and asked how well they knew each person on the roster. Each respondent was allowed to select as many residents as they wished. The closeness level ranged from "kind of knowing the name" and "relatively familiar" to "very familiar". To facilitate name recall, the roster included respondents' gender, volunteer groups/social clubs/managing organizations affiliations, and the address of the apartment building (i.e., a partial home address).

We then presented three hypothetical decision-making scenarios and asked respondents to nominate up to six candidates whom they preferred to make decisions on behalf of Kang in each scenario. These hypothetical scenarios aim to measure the input legitimacy of state penetration, as they ask respondents about how community management should be done. The three scenarios, which are closely related to Kang's routine management issues, were trash sorting (trash, hereafter), organizing Middle Autumn Festival (festival, hereafter), and reallocating parking spots (parking, hereafter). Trash sorting is a government command. Since July 2019, each Shanghai community is responsible for sorting trash within its boundaries and the RC is expected to accomplish this task. During the time of survey, the Kang's RC was trying to persuade the residents to follow this government order. In addition, the Kang's RC has held mid-autumn festivals annually since the current Party secretary took office. It is a community affair but sponsored by the state and usually organized by the RC. Finally, Kang residents have limited parking, and it has been a long-term major concern. Parking is a community decision outside the RC and has often been discussed in the HA's annual meetings.

Each scenario began with the following prompt: "Assuming the Kang community needs to have a committee managing the upcoming trash sorting/Middle Autumn Festival/relocating parking lots, who will you nominate for this task?" We asked respondents to provide names instead of listing attributes, and only showed them the name roaster if they requested it. If they could not give a specific name, we also recorded the mentioned positions (like the Party secretary, the head of patrol team, etc.). The respondents were then asked an open-ended question about the reasons for their choices. The answers were audio recorded, transcribed, and then coded as reasons for nomination. If the respondent refused to select anyone on the roster, they could name other residents, or simply drop the question.

Measures

We classify respondents' degree of state affiliation by Kang's governance structure (Figure 1). Respondents are classified as state affiliated if they serve on the RC or belong to the RC's three recruitment chains. Block captains and Party members are recorded as dummy variables, but the level of volunteer group participation is coded as numerical values because one respondent can participate in multiple volunteer groups. The other members in the thick network are coded as not being affiliated with the state. However, we differentiate respondents serving on the HA to examine the its relative position compared with the RC.

Control variables include age, gender, years of education, and years of residence. These basic demographic and socioeconomic variables have been found to be associated with community participation in urban China (Xu, 2007; Xie, 2015). Age is centered around the mean. Years of education were measured by the years of education converted from the highest level of degree attained.

Analytical strategy

Network structure is measured by three indicators: hierarchy, clustering coefficient, and average path length (Baldassarri and Diani, 2007; Woldense, 2018). Krackhardt's graph hierarchy indicates the overall level of asymmetry in the network. Clustering coefficient and average path length are used to assess the tendency for polycentricity. A hierarchical network has high scores in hierarchy and low scores in clustering. In contrast, a horizontal network has low scores in hierarchy and high scores in clustering.

Network popularity is modeled through exponential-family random graph models (ERGMs). Because each observation in network data is connected to others, ERGMs can take into account the endogenous and mutually dependent nature of ties, including node attributes and dyadic and triadic properties. That is, ERGMs can account for the dependence of the thick network and thus examine the relative popularity of state-affiliated actors in a statistically meaningful way. Models are estimated in the statnet package for R (https://statnet.org/).

Nominations in decision-making scenarios are modeled by ordinary least squares and generalized propensity score (to account for selection bias) (Hu, 2020). Popularity (one key independent variable) is measured as the number of "very familiar" nominations an individual receives in the Kang community network. All models include control variables listed above. We also use generalized propensity score matching to account for selection bias.

Results

Descriptive statistics of Kang's thick network

Table 1 demographic and socioeconomic.

Descriptive results of both connections and nominations (Table 1) show the RC's dominant role and the HA's subsidiary role in community governance. In terms of the number of connections,

TABLE 1 Descriptive statistics.

Variable	All sample	RC	Block captain	Volunteer groups	Party member	HA	Social clubs
Number of connections	48.32 (21.46)	82.44 (24.93)	49.94 (18.26)	59.54 (20.04)	55.84 (25.58)	75.00 (10.71)	47.83 (19.01)
Number of nominations							
Trash sorting	4.86 (8.46)	20.22 (12.85)	4.56 (8.73)	5.37 (8.32)	7.74 (10.38)	11.71 (9.41)	3.74 (8.11)
Festival	4.25 (9.46)	25.00 (18.34)	3.05 (6.37)	2.69 (5.51)	7.56 (12.98)	7.43 (9.71)	3.43 (6.89)
Parking	3.16 (7.58)	8.89 (12.18)	1.95 (4.47)	3.43 (7.87)	7.45 (12.60)	19.00 (14.98)	1.17 (2.62)
N	112	9	47	70	32	7	43

Standard deviation (S.D.) in paratheses.

RC members have the highest number of connections (82.44), followed by HA members (75.00). In terms of nominations in decision-making scenarios, the RC receives considerably more nominations in trash sorting and festival scenarios, while the HA receives many more nominations in the parking scenario than other groups. The separation falls into their service category (Bray, 2006; Read, 2012).

Network structure

Figure 2 represents the network structure of Kang's thick network. Nodes are sized by the number of incoming ties a respondent received. RC members tend to cluster at the center of the network, and Party members seem to be more popular than non-Party members, but they are more dispersed across the network than RC members.

We further compare the observed network measures to 1,000 simulated random graphs (Figure 3). The observed level of hierarchy is 0.245, which is significantly lower than that expected by chance (the whiskers are between 0.429 and 0.469). In addition, the observed clustering coefficient is higher than that expected by chance and the average path length does not differ from that expected by chance. All results suggest that the network is horizontal.

We then examine whether the network is hierarchical with one or a few core clusters at the center of a set of periphery clusters. To test this possibility, we first use the spin-glass algorithm to identify clustering, and then use average degree and PageRank of each cluster to measure the positions of clusters in the network (Table 2) (Ma and DeDeoc, 2018). A higher average degree and PageRank mean that a cluster is more influential. The four major clusters[2] exhibit similar sizes, similar average degree, and similar PageRank. All respondents affiliated with the state are dispersed across these clusters. These results again suggest a horizontal network with comparable clusters.

2 The fifth cluster is too small compared with other clusters. It likely belongs to a residual category.

Network popularity

To examine the relative popularity of state-affiliated residents in the Kang thick network, Table 3 reports ERGM results of the likelihood of receiving a strong tie, with three terms accounting for the dependence of actors—mutuality, GWESP, and cluster homophily.[3] Model 1 includes the RC and the HA; Models 2–4 include residents with state affiliation from three recruitment chains, respectively; and Model 5 adds all chains together. The coefficients do not change substantially between models so we explain the results in Model 5.

The network is dominated by residents with state affiliation. The RC as well as its recruitment chains are positive and significant. The RC is more central than the HA in terms of its position in the network. On average, the odds of receiving a strong tie is 87% higher ($e^{0.629} - 1$) for RC members than non-RC members, but only 12% higher ($e^{0.116} - 1$) for HA members than non-HA members. Compared with the results of the network structure, this finding suggests that the state penetrates not on overall structure but on the relative position of the RC and state-affiliated residents in the network.

After the RC's influence is accounted for, participation in volunteer groups and active Party membership are also positively associated with network popularity. Only the coefficient on block captains is not statistically significant. One possibility is that members of this group mainly interact with residents within each block and thus do not come into contact with as many residents as volunteer groups and Party members.

Community decision-making power

Table 4 examines the circumstance under which the state penetrates the decision-making of routine community activities. M1 set adds the RC and its three recruitment chains, M2 adds

3 Mutuality estimates the likelihood an i → j tie conditional on a j → i tie (i.e., reciprocity). GWESP statistics estimate triad closure, which has been shown to work well in practice to overcome model degeneracy (Goodreau, 2007). Cluster homophily estimates whether i and j are in the same cluster (from the spin-glass models results in Table 3). The three coefficients suggest that the connections are more likely to be symmetrical and clustered.

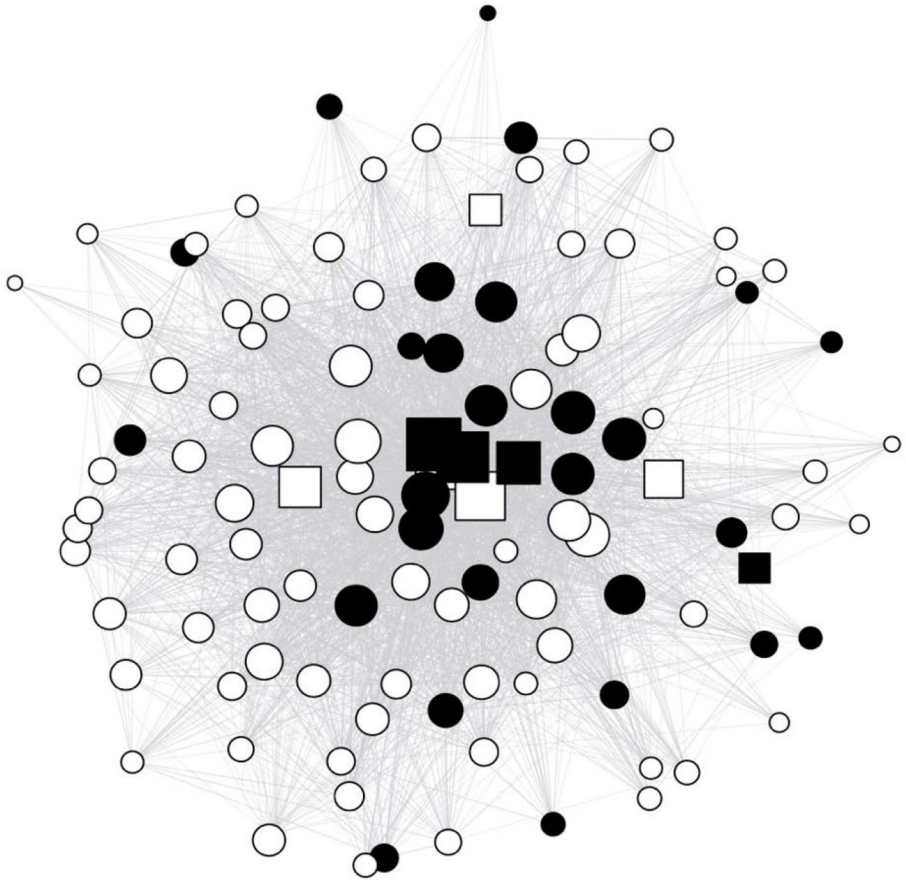

FIGURE 2
Structure of Kang community thick network ($N = 112$). Square-RC members; circle: other residents; black-Party member; white: non-Party member.

network popularity, and M3 examines if the results have selection effect (i.e., popularity is an intentional effort).

Through comparing results between M1 set and M2, we can see that state affiliation is crucial for being granted decision-making power, but this positive association can be explained by these residents' high levels of network popularity. Before adding the network popularity (M1), RC, volunteer group participation, and Party members (only in the festival scenario) have more decision power. After network popularity is accounted for, only RC and volunteer group participation remain significant and positive in the trash scenario. The rest of the coefficients on state affiliation are substantially reduced and lose statistical significance. In contrast, network popularity is the most persistent indicator of decision-power and the size is fairly similar across scenarios. Thus, one's position in the network matters more than political identity with regard to community decision-making power.

The different patterns of association among the three recruitment chains have several potential explanations. In both M1 and M2, the coefficients on block captains are not statistically significant, perhaps because of this group's limited community reach compared with volunteer groups. The coefficient on Party membership is positive only in the festival scenario, and it loses statistical significance after network popularity is added. Both implementing trash sorting and organizing the festival fall into the RC's service category, but only the festival invokes Party identity, probably because trash sorting is a mundane, tedious administrative mandate that only needs residents who have service experience. This possibility is also indicated by the coefficients on volunteer group participation remaining positive in the trash scenario. It confirms that service provision is the major way to gain decision-making power in the Chinese urban community.

A question still remains on whether the positive association between state affiliation and network popularity is a pure coincidence or an intentional process by the state. That is, it is unknown whether the state or the Party deliberately places its supporters (e.g., volunteers and Party members) in critical service roles to improve their network popularity in the community and use their social influence to shape community decision-making. To address the possibility of a deliberate selection process, we adjust the results with generalized propensity score matching in the M3 set.[4] Most coefficients remain significant in the same direction, which indicates the robustness of our results. After accounting for the selection process, the RC and the state-affiliated actors become more important in all scenarios. Especially in the parking scenario

4 Independent and control variables in the selection model for network popularity used the same independent and control variables as the models in Table 4.

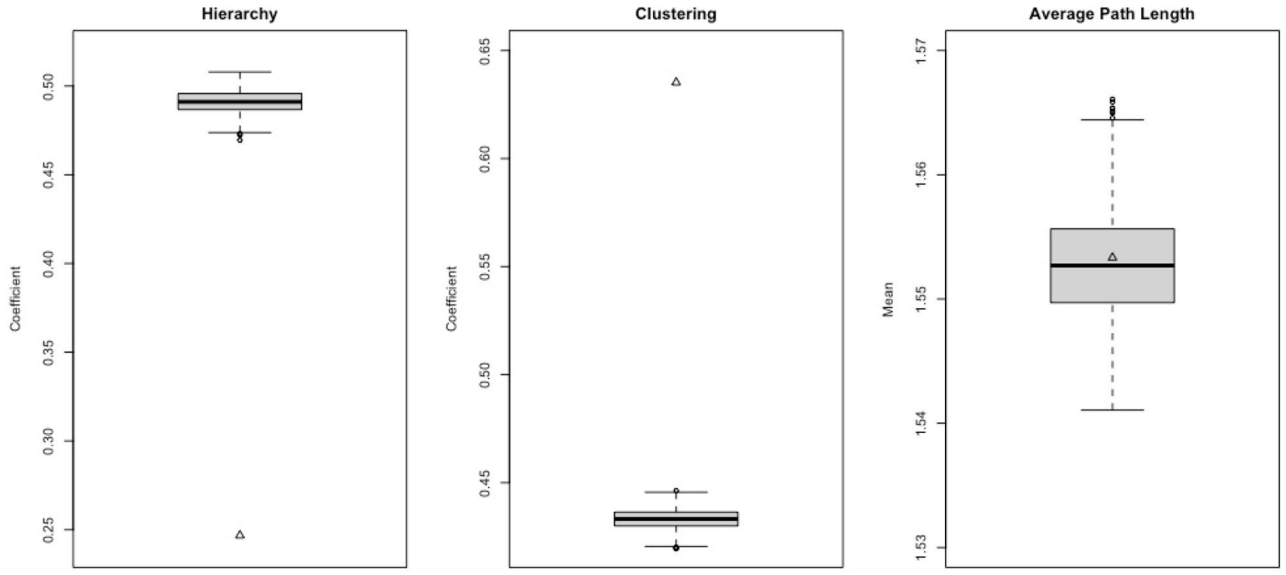

FIGURE 3
Comparing measures (hierarchy, clustering, and average path length) between observed Kang community network (triangle without filling) with the distribution of values obtained from 1,000 simulated random graphs with preserved degree distribution (boxplots). (1) The random graphs are generated by the Erdo-Renyi simulation method with the same number of nodes and edges as the Kang community network. (2) Whiskers extends to the most extreme datapoints that is no more than 1.5 times the interquartile range from the box. Dots without filings are outliers. (3) If the observed value is outside the whiskers, we consider it to be significantly different from the values generated by chance.

in which the state appears to exert no influence, variables for both the RC and Party members are positive and significant. These results indicate that the state may intentionally select, cultivate, or co-opt to secure central network positions for its allies to wield decision-making power over community affairs.

Respondents' reflections

In the open-ended questions, respondents shared reasons for nominating certain individuals. A recurring theme across three scenarios indicates that state-affiliated residents possess influence and prestige in the community. For example, Ms. Yang,[5] the Party secretary, has the highest number of nominations in all three decision-making scenarios. A majority of respondents explicitly emphasize she should be the chair of all three committees (for three scenarios) for "she has high prestige among residents (*zai juminzhong weiwang hengao*, 在居民中威望很高)," "her words count (*shuohua guanyong*, 说话管用)", as well as "she can convince other people (*neng shuofu qita ren,* 能说服其他人)".

Holding a popular position in the community is powerful even in the parking scenario. For example, Mr. Zhang, who leads the neighborhood patrol team and is an active participant in several volunteer groups, is among the top 5 nominations. One respondent commented on her choice to select Mr. Zhang: "Because he is very active in the community. He cares about community issues and he is willing to share with us." State-affiliated residents enjoy such trust from respondents, regardless of block captains, volunteer group participants, or Party members. Through active and long-term involvement in community volunteering, these leaders gain credibility and win the trust of fellow residents. As one respondent remarks, "Everyone can see if they have a Party spirit through long-term devotion to our community. Deeds truly speak louder than words." In comparison, RC members are nominated primarily for their administrative roles. Notably, some respondents avoid nominating RC members because they explicitly do not want to add to their administrative burden. As such, the state carries out a conscious process of cultivation of state-affiliated residents' network popularity.

The HA's head account also shows state co-optation with non-state-affiliated residents in the thick network. The current HA head, Ms. Tan, also receives popularity votes. She is a retired accountant and was herself a branch Party secretary in her company before retirement. During her HA term, she established the standing book system to track HA expenses and publicize it to fellow residents on a monthly basis. Consequently, respondents nominated Ms. Tan as she is a "fair (*gongping* 公平)" person. Several respondents mention that fellow residents and the RC sometimes seek the HA's assistance in solving residents' disputes. When we asked Ms. Tan's reasons for nominating Ms. Yang, she responded:

> Many residents do not venture (*bugan zaoci* 不敢造次) the Party secretary. When they come to the RC to make a request, they know the meaning and position of the RC and the community Party branch, they can be humble (*ditou hayao*

5 All names mentioned in this article are pseudonyms.

TABLE 2 Description of 5 clusters in Kang community network.

Cluster	Size (nodes)	Average degree	PageRank	RC	Block captain	Volunteer groups (mean)	Party member	HA
1	27	56.15	0.0095	0	15	1.44	7	2
2	27	49.19	0.0085	1	16	0.78	4	0
3	20	48.05	0.0089	4	3	1.20	7	2
4	33	43.97	0.0094	4	10	0.70	14	3
5	5	31.20	0.0053	0	3	0.60	0	0
Total	112	48.32	0.0089	9	47	0.98	32	7

RC, residents' committee; HA, homeowners' association.

TABLE 3 Coefficients from exponential random graph models (GWESP) predicting the log odds of receiving a connection, Kang community network ($N = 112$).

	Model 1	Model 2	Model 3	Model 4	Model 5
Edges	−15.259*** (1.452)	−15.161*** (1.494)	−15.124*** (1.402)	−15.287*** (1.456)	−15.182*** (1.394)
Mutual	1.896*** (0.062)	1.896*** (0.062)	1.889*** (0.064)	1.892*** (0.064)	1.887*** (0.062)
GWESP (alpha = 1.0)	4.754*** (0.516)	4.716*** (0.529)	4.650*** (0.497)	4.778*** (0.516)	4.681*** (0.495)
Clusters	0.173*** (0.036)	0.176*** (0.036)	0.176*** (0.039)	0.172*** (0.035)	0.170*** (0.038)
Residents' committee	0.603*** (0.054)	0.607*** (0.053)	0.632*** (0.053)	0.592*** (0.053)	0.629*** (0.053)
Homeowners' association	0.166*** (0.046)	0.167*** (0.047)	0.108* (0.048)	0.166*** (0.046)	0.116* (0.049)
State-affiliation					
Block captain		0.039 (0.025)			0.048 (0.025)
Volunteer group participation			0.055*** (0.012)		0.050*** (0.012)
Party member				0.092*** (0.027)	0.076** (0.028)
Controls					
Age	−0.004* (0.02)	−0.004* (0.002)	−0.004* (0.002)	−0.005* (0.002)	−0.004* (0.002)
Male	0.071* (0.031)	0.075* (0.031)	0.035 (0.034)	0.043 (0.033)	0.021 (0.033)
Years of education	−0.029*** (0.005)	−0.029*** (0.005)	−0.025*** (0.005)	−0.033*** (0.005)	−0.028*** (0.005)
Year of residence	0.029*** (0.004)	0.028*** (0.004)	0.029*** (0.004)	0.030*** (0.004)	0.028*** (0.004)
Deviance	17,234	17,234	17,234	17,234	17,234
BIC	14,263	14,228	14,193	14.226	14,233

Two-sided test.
*$p < 0.05$.
**$p < 0.01$.
***$p < 0.001$.
Numbers in parentheses are standard errors.

> 低头哈腰). But in the HA, they know the HA is civic, and they feel you take their money, so they roll their eyes up (*yanjing xiangshangfan* 眼睛向上翻).

Most non-state-affiliated respondents, regardless of whether they are from the thick or thin network, share a similar understanding. They see Ms. Yang's position and prestige as they recognize their Party membership and community leadership. This understanding also applies to other RC and HA members, as well as leaders of volunteer groups and social clubs. They consider that community issues are easier to implement if they are "led by the RC and under the RC's supervision" and deferred to Ms. Yang and the RC's decision. This acknowledgment suggests Ms. Yang's conscious co-optation has succeeded.

Robustness check from the thin network

To see if the thick network's viewpoints are shared by the thin network, we also invited 55 residents who have occasional contacts with the RC to do the survey. They were surveyed using the same procedure used for the thick network. Table 5 shows the regression results for their familiarity level with the thick network and their nomination choices.

TABLE 4 Coefficients from linear regression models predicting number of nominations (in logarithm scale) in three decision-making scenarios.

	M1: state affiliation			M2: state affiliation + popularity			M3: intended selection		
	Trash	Festival	Parking	Trash	Festival	Parking	Trash	Festival	Parking
Network popularity				0.052** (0.017)	0.054*** (0.011)	0.038* (0.018)	2.500*** (0.379)	2.965*** (0.407)	2.149*** (0.481)
Residents commitee	4.852*** (1.156)	3.716*** (0.766)	2.504* (1.152)	2.671* (1.325)	1.493^{+} (0.815)	1.022 (1.332)	1.899*** (0.335)	1.719*** (0.324)	1.236** (0.427)
Homeowners' association	1.000 (1.013)	0.744 (0.663)	2.931** (0.977)	0.435 (0.990)	0.224 (0.599)	2.614** (0.969)	0.031 (0.303)	−0.188 (0.309)	1.741*** (0.378)
State-affiliation									
Block captain	0.393 (0.494)	0.390 (0.330)	0.233 (0.510)	0.155 (0.481)	0.121 (0.298)	0.135 (0.502)	−0.479* (0.236)	0.223 (0.234)	−0.631* (0.300)
Volunteer group participation	1.409*** (0.241)	0.723*** (0.161)	0.655** (0.247)	0.958*** (0.276)	0.220 (0.176)	0.306 (0.294)	0.509*** (0.102)	0.280* (0.099)	0.022 (0.132)
Party member	0.141 (0.573)	0.796* (0.384)	0.639 (0.566)	−0.259 (0.566)	0.389 (0.351)	−0.048 (0.689)	−0.211 (0.234)	0.186 (0.219)	0.765* (0.303)
Controls									
Age (mean centered)	−0.033 (0.038)	−0.004 (0.025)	−0.056 (0.040)	−0.026 (0.037)	0.001 (0.022)	−0.048 (0.039)	0.014 (0.016)	0.031 (0.015)	0.049* (0.021)
Male	0.529 (0.640)	−0.564 (0.468)	1.612* (0.706)	0.942 (0.630)	−0.023 (0.430)	1.943** (0.710)	0.324 (0.335)	−0.836 (0.340)	−0.277 (0.436)
Years of education	−0.163 (0.100)	0.145* (0.067)	0.153 (0.103)	−0.170^{+} (0.096)	0.113^{+} (0.058)	0.139 (0.102)	−0.063 (0.045)	0.100 (0.046)	0.088 (0.059)
Year of residence	−0.023 (0.072)	0.054 (0.048)	0.085 (0.071)	−0.079 (0.071)	0.003 (0.044)	0.034 (0.073)	−0.008 (0.034)	−0.009 (0.032)	−0.015 (0.042)
Intercept	−0.900 (1.527)	−4.193*** (1.005)	−6.159*** (1.529)	−1.335** (1.473)	−4.501*** (0.897)	−6.326*** (1.500)	−8.535*** (1.441)	−12.289*** (1.581)	−9.222*** (1.806)
Adjusted R^2	0.396	0.448	0.424	0.443	0.563	0.447	0.652	0.753	0.589
Sample size	106	100	92	106	100	92	106	100	92

Two-sided test.
$^{+}$p < 0.1.
*p < 0.05.
**p < 0.01.
***p < 0.001.
Numbers in parentheses are standard errors.

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TABLE 5 Coefficients from linear regression models predicting familiarity and nominations.

	Popularity (log)	Trash (log)[b]	Festival (log)[b]	Parking (log)[b]
Network popularity[a]		0.233*** (0.042)	0.204*** (0.317)	0.203*** (0.035)
Residents commitee	1.612*** (0.491)	0.151 (1.210)	0.860 (0.915)	−0.446 (1.005)
Homeowners' association	0.334 (0.433)	1.696 (0.868)	−0.226 (0.656)	2.413*** (0.721)
State-affiliation				
Block captain	0.521* (0.205)	0.486 (0.418)	0.001 (0.316)	−0.307 (0.347)
Volunteer group participation	0.218* (0.102)	0.524* (0.222)	0.232 (0.168)	−0.050 (0.185)
Party member	0.490* (0.245)	−0.321 (0.515)	−0.154 (0.390)	−0.101 (0.428)
Controls	Added	Added	Added	Added
Adjusted R^2	0.236	0.483	0.569	0.434
Sample size	112	112	112	112

Two-sided test.
*p < 0.05.
**p < 0.01.
***p < 0.001.
Numbers in parentheses are standard errors.
[a]Popularity is measured as the number of "very familiar" ties active residents received from the thin network.
[b]There are 5 nominations outside the "thick network" in the trash scenario, 1 nomination outside the "thick network" in the festival scenario, and 4 nominations outside the "thick network" in the parking scenarios. These outside nominations were dropped in the regression analyses.

The results are consistent between the thick and the thin networks. Consistent with results in Table 3, the RC enjoy a significantly higher level of network popularity than non-RC member. In addition, state-affiliated residents—block captains, volunteer groups, and Party members—enjoy a significantly higher level of popularity than ordinary residents. In fact, block captains enjoy higher popularity within the thin network but not within the thick network. Block captains are probably the closest to ordinary residents who do not make regular contacts with the RC.

In terms of decision-making nominations, the results from the thin network also suggest that network popularity is the most important and consistent determinant of number of nominations that a resident could receive. After controlling for network popularity, the pattern of association is also consistent between Tables 4, 5. The only exception is the coefficients on RC, which are significant and positive in the trash and festival scenarios in the thick network (Table 4) but not significant in the thin network (Table 5). The findings suggest that the RC gains more trust with the thick network than the thin network.

Discussion and conclusion

This study is among the first to use a network approach to examine the state's penetration in community governance in urban China. Our research, based on a network of all members of the thick network in Kang, supports that the state can exert its authority in the horizontal community network with nuanced penetrating strategies.

The thick network is indeed horizontal (rather than hierarchical) around the RC. Instead of manifesting state power, network popularity translates into decision-making power in routine community activities. However, those with high network popularity are affiliated with the state power. This positive association between network popularity and state affiliation is not a coincidence but is generated by the state through a deliberate process: Rather than overt suppression or infiltration, the state places the RC and state-affiliated residents at the center of the network to ensure that the self-organized participation takes place under state domination.

Some limitations of the paper are worth mentioning. First, the hypothetical scenarios may be different from how actual decision-making processes take place in the Kang community. We tried to minimize that discrepancy by using examples that Kang residents experience or care about. Admittedly, the actual decision-making processes can be more complicated than selecting just six representatives. In the actual process of implementing trash sorting,[6] for example, we observed that the RC needs to motivate many more Party members and participants in volunteer groups than six representatives due to time constraints and fading willingness of these volunteers. Future work can compare our results with actual decision-making processes for further validation.

Second, caution is warranted when extrapolating these findings to other types of Chinese urban communities or to communities in countries besides China. First, the Kang neighborhood was a middle-class residential neighborhood in which residents had little previous contact with each other before moving into the neighborhood. The autonomy of community participation may be lower in working-class or poor communities, as their residents rely more on the residents' committee for social welfare delivery (Min, 2014). The network structure may also differ in neighborhoods built before the 1980s, in which residents often know each other through work (Shu, 2017). Second, urban Chinese neighborhoods are gated while neighborhoods in most other countries are not. The

6 We happened to observe this process as Kang was implementing this government mandate during the period of data collection.

clear physical boundary may reinforce within-neighborhood ties but simultaneously make it easier for the state to intervene. Future research needs to explore these differences.

In conclusion, the state's penetrating strategies observed in the Kang community network are adaptable and flexible. Rather than eliminating the existing network or building infiltrating institutions, the RC and community Party branch in Kang have effectively harnessed the thick network to implement government commands and deliver services. Our findings show that the state-society relationship at the grassroots level unfolds in complex, fluid, and flexible ways, which center around the motivations, attitudes, and working methods of community elites. Network analyses therefore offer a promising way to capture the choices of the state in its penetrating strategies to maintain a relatively strong but docile society.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by the Ethics Committee, School of Social Development and Public Policy, Fudan University. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

FT: Writing – original draft, methodology, software, Writing – review & editing. LC: Writing – review & editing. YW: Methodology, Software, Visualization, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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