

# ~~Who's in Charge~~ Who Are in Charge, Who Do I Work With, and Who Are My Friends: A Latent Space Approach to Understanding Elite Coappearances in China\*

## Abstract

How the ruling elite arrange and maintain their power-sharing is key to our understanding of authoritarian politics. We propose a latent space framework to systematically analyze the dynamics of elite power-sharing in authoritarian regimes. We also introduce a novel dataset tracking appearances of elite Chinese Communist Party (CCP) members at political events. Our new framework and data allow us to disentangle three key aspects of ~~CCP~~ elite power-sharing ~~in authoritarian regimes~~: (1) who's ~~are~~ in charge, (2) who do I work with, and (3) who are my friends. ~~Using a latent factor network analysis of about 10000 appearance records of over 200 top CCP elites from 2013 to 2017, we empirically assess the three questions by computing elites' total appearances, dyadic coappearances, and their latent network distance. We test how well these three indicators fare in predicting elites' appointments in the leading small groups (LSGs) of the CCP Central Committee and the Central Government.~~

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\*The replication datasets and codes will be available online.

Only one in ten autocrats are toppled down by popular uprisings. Most authoritarian rulers are instead ousted by regime insiders (Svolik, 2012). How the ruling elite arrange and maintain their power-sharing is thus key to our understanding of authoritarian politics (Bueno de Mesquita et al., 2003; Acemoglu, Egorov and Sonin, 2008; Svolik, 2012). A burgeoning literature turns to authoritarian institutions (e.g., national legislatures) and explores how institutionalization of power-sharing contributes to authoritarian resilience (e.g, Brownlee, 2007; Gandhi, 2008; Magaloni, 2008; Magaloni and Kricheli, 2010; Boix and Svolik, 2013), as well as economic growth (e.g., Bizzarro et al., 2018), social welfare provision (e.g, Miller, 2015b), and accountable foreign policies (e.g., Weeks, 2012). However, as stressed by Pepinsky (2014), a fundamental dilemma confronting this “institutional turn” is that these institutions are inherently endogenous to strategic interactions of the ruling elite (also see Brancati, 2014). That is, de facto cooperation and contention of the authoritarian elite still hide behind the facade of formal institutions.

Another group of scholars have adopted an alternative and elite-oriented approach to uncovering the inner workings of authoritarian regimes. Relying on a wide range of data like anecdotes, interviews, media coverage, and biographical archives, these studies try to identify key elites and analyze their social backgrounds, career patterns, and patronage ties (e.g., Li and Bachman, 1989; Levitsky, 2001; Albrecht and Schlumberger, 2004; Perthes, 2004; Shih, Shan and Liu, 2010; Oppen, Nee and Brehm, 2015; Buehler and Ayari, 2018). However, partly due to data limitations, we find few attempts to synthesize different aspects of elite dynamics, leaving us with only a fragmented perspective on power-sharing in authoritarian regimes. Unfortunately, it is this lack of a systematic approach that fundamentally constrains our understanding of authoritarian politics.

In this article, we propose a latent space framework to systematically map and analyze the dynamics of elite power-sharing in authoritarian regimes.<sup>1</sup> We also introduce a new type of data

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<sup>1</sup>To clarify, here we use the term of latent space in a generic sense, i.e., some area where elites with similar preference are in proximity to each other. In our later analysis, we treat the space as a latent factor space and use the the Latent Factor Model (Hoff, 2005; Minhas, Hoff and Ward,

that has yet to come to attention of scholars of authoritarian politics, that is, elite appearance and coappearance at political events. Our new framework and data allow us to disentangle and synthesize three key aspects of elite power-sharing in authoritarian regimes: (1) who's are in charge, (2) who do I work with, and (3) who are my friends. The question of "who's are in charge" focuses on the power and influence of *individual* elites. The answer to this question is of critical importance in authoritarian regimes where formal political institutions are vulnerable to elites' manipulation. Moving beyond individual and monadic elites, the question of "who do I work with" points to the *dyadic* relationship between a given pair of elites (e.g., collegial ties and patronage connections), which serves as the very basis of coalitions and factions. However, a simple dyadic "who do I work with" approach will, we argue, overlook the indirect and latent relationships between elites and forgo important information about latent coalitions. For instance, without a direct collegial or patronage connection, two elites could still form a latent coalition because of their ties to a common friend. The question of "who are my friends" then captures such indirect *latent* connections between elites. Together, by jointly considering the monadic, dyadic, and latent attributes, the three "who" questions reveal systematic dynamics of elite power-sharing in authoritarian regimes.

Our empirical analyses and tests are focused on the Chinese Communist Party (CCP) regime. While the CCP regime has been commonly accepted as one of the most institutionalized and "machine-like" authoritarian regimes, many China scholars emphasize that institutional rules are epiphenomenal to elite politics (Nathan, 1973; Tsou, 1976; Shih, Shan and Liu, 2010). After Xi Jinping became the general secretary of CCP in 2012, the interest in elite power-sharing has been rekindled and become even more heated. Xi's first term was marked with major elite reshuffles, swift institutional changes, and wide-ranging policy alterations (Miller, 2014a; Naughton, 2014; Lampton, 2015; Shirk, 2018). These dramatic changes not only urge us to reassess CCP's intra-elite relations, but also make it an ideal laboratory to explore the three "who"

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2016), which is different from the Latent Space Model proposed by Hoff, Raftery and Handcock (2002).

questions. Specifically, we utilize a latent factor network model (Minhas, Hoff and Ward, 2016) and analyze a unique database that tracks about 10000 appearance records of over 200 top CCP elites from 2013 to 2017. We attempt to answer the three “who” questions by computing elites’ total appearances (i.e., “who are<sup>s</sup> in charge”), dyadic coappearances (i.e., “who do I work with”), and, finally, their latent network distance (i.e., “who are my friends”). Together, our latent factor analysis of the appearance data presents a possible avenue to disentangle and synthesize key aspects of elite power-sharing in authoritarian regimes.

To probe the validity of this approach, we examine how well these three indicators fare in generating out-of-sample predictions of elites’ appointments in the leading small groups (LSGs) of the CCP Central Committee and the Central Government (Batke and Stepan, 2017; Huhe and Stepan, 2018). LSGs are an informal institutional arrangement of CCP that has not been incorporated into charts of party or government organs. However, they play a pivotal role in formulating, coordinating, and implementing of important decisions across different segments and levels of the CCP regime (Hamrin, 1992; Lieberthal, 1992). LSGs not only ameliorate the regime’s prolonged problem of political fragmentation, they can also be an effective vehicle for overpassing formal institutions and asserting personal influences as shown by the infamous Central Cultural Revolution Group (1966-69). Recently, it has been found that Xi relied heavily on LSGs to push forward institutional reforms and policy changes (Miller, 2014b; Naughton, 2014; Johnson, Kennedy and Qiu, 2017; Lee, 2017; Shirk, 2018). Our tests then show that while elites’ total appearances are strongly associated with their appointments in LSGs memberships, their dyadic coappearances bear a much weaker association. Most notably, the best predictor of LSG membership is our latent measure of network proximity.

Our study contributes to the extant studies of authoritarian politics in many ways. First, our latent space framework (i.e., the three “who” questions) provides a possible approach to bridge and synthesize the fragmented studies of the ruling elite in authoritarian regimes. This allows us to develop a systematic assessment of their power-sharing patterns and dynamics. Second, our approach explicitly highlights and models the latent relationships between elites, which so far has

received only scant scholarly attention. As revealed in our analysis of LSG appointments, the incorporation of such latent distances could significantly improve our assessment about elite power-sharing. Finally, our study introduces a new source of data, i.e., public appearances of the elite. The appearance data not only complements our existing data like news coverage and biographical archives, but, more importantly, allows for a systematic exploration of the dynamic and relational changes in elite power-sharing.

## **I Literature Review: The Elite and Their Relationships**

How to understand the elite and their relationships behind the facade of formal institutions has been one enduring question in social science. For instance, the “power elite” thesis emerged in 1950s stimulated a heated debate on whether power in America was concentrated on a small cohesive group of quasi-hereditary and well-positioned elites ([Hunter, 1953](#); [Mills, 1956](#); [Dahl, 1961](#)). The debate in turn has significantly advanced our understanding about the nature of democracy (e.g., [Dahl, 1971](#)). In studies of authoritarian politics, scholars have been increasingly confronted by the same problem, particularly after the recent development in studies of authoritarian institutions. Although recent theoretical works like [Svolik \(2012\)](#) provide us valuable insights to link authoritarian institutions with elite contention and cooperation, we still lack a systematic framework to conceptualize and analyze the actual power-sharing dynamics in authoritarian regimes.

Our lack of a systematic framework has much to do with the highly secretive nature of authoritarian politics. It restricts researchers to employing methods such as Hunter’s ([1953](#)) sociometric interviews emerged in the “power elite” debate. Many studies of authoritarian elites therefore have “been based on anecdotal and impressionistic ‘readings of the tea leaves’” ([Ishiyama, 2014](#), p. 137). Given these limitations, a number of scholars have introduced novel empirical approaches to explore different aspects of elite politics. Such studies are particularly developed in the studies of the CCP elite, and they largely fall into two separate lines of inquiries:

(1) identifying key actors (i.e., the positional approach) and (2) exploring their relations (i.e., the relational approach).

First, the positional approach focuses on *individual* elites and aims to assess their de facto positions within the CCP regimes. [Jaros and Pan \(2017\)](#) exemplifies this approach as they explore Xi's actual power and influence by examining CCP's official newspaper coverage. It is argued that the ruling elite usually rely on official media to signal their political presence and influence to the lower-level officials and the general public ([Huang, 2015](#)). Their coverage in official newspapers, therefore, can be used to infer their ability to dominate the party-state. Based on their ~~collection and~~ analysis of province-level party newspapers between 2011 and 2014, [Jaros and Pan \(2017\)](#) find that Xi has received disproportionately more coverage over time, indicating a consolidating grip on power. Such large-scale quantitative analysis of texts allow us to reveal ups and downs of key elites in a dynamic way.<sup>2</sup> However, due to its focus on individual elites, this approach falls short in uncovering the relations between CCP elites.

The relational approach, on the other hand, examines *dyadic* affinity and ties between elites. This empirical approach is rested on the thesis of factional politics. It postulates that the political struggle between competing factions is the key to our understanding of CCP elite politics, and a faction usually grows out of patron-client relationships that are cultivated by a patron through the career path ([Pye, 1981](#); [Nathan and Tsai, 1995](#); [Huang, 2000](#); [Shih, Shan and Liu, 2010](#); [Shih, Adolph and Liu, 2012](#)). Empirically, scholars rely [mainly](#) on biographical archives to uncover such patron-client relationships. Based an extensive review, [Meyer, Shih and Lee \(2016\)](#) identify four different empirical indicators of factional ties, i.e., broad ties, complete work ties, early work ties, and restrictive work ties. They further examine how CCP elites' varying ties with the party secretary general predict their promotion into the Central Committee. Their analysis shows that while work ties with the secretary general consistently matter, non-work ties (e.g., a common educational background) sometimes could also help. In light of this, by steering our attention to factional ties associated with key patrons, this approach helps us to move beyond the power core

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<sup>2</sup>For similar studies, see the review of [Ban et al. \(forthcoming\)](#).

and probe links ~~across~~among ruling elites.

While these two approaches provide us important insights about elite dynamics of the CCP regime, we find that some critical problems remain unresolved. First and foremost, we still lack a conceptual framework to synthesize different insights from the existing studies (e.g., dynamic changes of personal powers on the one hand and abiding factional ties between patrons and clients on the other). This in turn hinders our systematic understanding of elite power-sharing. Second and more specifically, our emphasis on key patrons and their direct clients tend to leave much valuable information neglected. This is mainly due to the importance and prevalence of *indirect* and *non-dyadic* relationships. A client of a factional leader, for instance, could also serve as the patron for other elites, forming a three-party relationship. The existence of such indirect relationships not only significantly increases the scope of factions, but, more importantly, generates a complex interdependent network of elites. Without a systemic study of such indirect relationships, we are unable to answer a series of important questions like hierarchies within factions or nuanced distinctions between apathetic and antagonistic relationships. ~~Thus by using extant approaches, w~~We are limited to only looking at direct relationships rather than being able to holistically study the complete system of affinity, patronage, and antipathy. To understand elite dynamics, and thus authoritarian politics writ large, requires both new conceptual exploration and empirical strategies.

## II Elite Power-Sharing as a Latent Space

In this study, we conceptualize the elite power-sharing in authoritarian regimes as a latent space. This latent space not only encompasses a collection of individual elites, it subsumes all the relationships between them, direct or indirect. In light of this, a latent space understanding could allow us to synthesize both *positional* and *relational* attributes of the ruling elite and thus develop a systematic view about power-sharing in authoritarian regime. Yet, despite its apparent conceptual advantages, a latent space understanding requires us to answer two critical questions:

(1) how to capture it and (2) how to analyze it.

## **A Political Events and Power *Foci***

How to capture the power elite and their relationship has been a key front of the power elite debate ([Domhoff, 2005](#)). In *Who Governs? Democracy and Power in an American City* (1961), Dahl argues that the problem has risen from the obscure distinction between the legal theories of power and the realities of power: “the American creed of democracy and equality prescribes many forms and procedures from which the actual practices of leaders diverge. Consequently, to gain legitimacy for their actions leaders frequently surround their covert behavior with democratic rituals” (p. 89). Recognizing this, Dahl proposes to focus on political events and meetings where the actual processes of influence are at work. For instance, after observing local political nominations, Dahl finds that “the number of persons who have participated in these decisive negotiations and influenced the outcome seems never to have been more than a half dozen in recent years” (p. 105).

In this study, we follow Dahl’s approach and turn to what we call power *foci*, i.e., important political events and meetings as well as elites’ appearances at them. The concept of foci is originally introduced by [Feld \(1981\)](#) to explore people’s complex and embedded social circles in a community. A focus is usually defined as a social entity or event around which joint activities are organized (e.g., voluntary organizations, hangouts, and families). Since it is around these foci that individuals organize their social relations, we could learn essential features of their latent social space by studying the observable foci. Similarly, we argue that political events like ceremonies, policy meetings, and state visits can be treated as power foci, around which the ruling elite signal and manage their power relationships. For instance, an elite’s presence in a policy meeting would suggest her or his involvement in the decision-making activities and thus convey valuable information about the actual processes of influence. As the ruling elite coordinate with each other via numerous such events, we could approximate their latent space of power-sharing by examining how these foci are interconnected.



The interlocking network of power foci reveals both positional and relational attributes about the ruling elite. It is positional in its ability to uncover individual elites' relative activeness and prominence in events where the actual processes of influence are at work. Moreover, the particular patterning of an elite's appearance defines her or his points of reference in the nebulous ruling group. This is consistent with Dahl's (1961) emphasis on observing decision-making activities. The interlocking foci network is also relational. Beyond specific events or individual elites, it shows how elites are connected via a variety of political events. Political elites intersect with each other within different political events, which are created based on shared policy problems or personal affinities. These links are not only able to channel important resources like information, but also can support mechanisms through which elites monitor and sanction each other.

## **B Three “Who” Questions in a Latent Space**

So how can we approximate the latent space of power-sharing from the interlocking foci network? In this study, we treat the foci network as a product of both stochastic and strategic factors. We further disaggregate the strategic factors into three questions — i.e., who's are in charge, who do I work with, and who are my friends, which correspond to the individual level characteristics, dyadic links, and latent affinities. Generally speaking, our approach can be summarized as follows: after controlling for random noise, powerful elites (i.e., who's are in charge) are more likely to make appearances; elites who are in the same and related policy domains (i.e., who do I work with) are more likely to appear together; and finally elites who share latent affinities (i.e., who are my friends) are more likely to show up together. Together, the “three” who questions help us to approximate the latent space of elite power-sharing.

The first two who questions are quite consistent with the existing studies of elite politics. Similar to such positional studies as Jaros and Pan (2017), the question of who's are in charge is focused on network dynamics that are stemmed from characteristics of individual elites. For instance, certain type of actors tend to be more active in initiating connections. In our case of elite politics, this suggests that powerful elites are more likely to preside and participate in important

ceremonies and meetings. From the network analysis perspective, this greater tendency of certain actors to undertake certain behaviors is usually referred as the first-order dependency (Hoff, 2005; Kenny, Kashy and Cook, 2006). In light of this, we expect, for example, Xi Jinping is simply going to make more appearances in aggregate than would a junior CCP elite. That is, if we compare two possible elites, a third person is *ceteris paribus* more likely to make a coappearance with Xi than with the junior CCP elite. On the other hand, the second who question examines if two elites attend the same event. Given its focus on the observable direct and dyadic links, this question follows the similar approach like Shih, Shan and Liu (2010). The question of “who do I work with” then highlights whether there is a direct coordination and collaboration between a pair of elites.

However, what we emphasize in this study is that we cannot equate “who do I work with” with “who are my friends.” Simply using direct and dyadic links as a proxy of the latent affinity could lead to two types of errors, the incorrect rejection of a true friend and the false acceptance of a real enemy. A simply example of the first error is an indirect patronage relationship which involves a patron, a client, and a sub-client. If we rely solely on dyadic coappearance, we may end up in wrongly rejecting the relationship between the patron and sub-client. The second error could also occur in a three-party relationship when an elite share links with two rival patrons. In this case, we could run into either a false conclusion or no conclusion at all. Provided with these possible errors, some scholars have questioned the validity of factional studies based on dyadic analyses. For example, Miller (2015a), a long-time observer of CCP elite politics, points to two problematic cases (i.e., Liu Yunshan and Li Yuanzhao), both of whom share strong ties with competing Jiang and Hu factions. Without a consistent criterion, she argues that “in the Xi era, faction-based analyses frequently rest on assertions of factional association that are tenuous, arbitrary, and at times peculiarly fungible” (p. 7).

In this study, we argue that the above problems stem from the prevalence of indirect ties in elite politics, and one remedy is to examine the more complex and non-dyadic relationships like the aforementioned three-party transitivity problems. We thus turn to the question of “who are my

friends,” which is commonly accepted as the third order dependency in network analysis.<sup>3</sup> Unlike first-order dependencies that are associated with attributes of individual actors, such high-dimensional dependencies usually arise from mechanisms like [latent](#) homophily and stochastic equivalence. Homophily is the tendency for actors who share unobserved characteristics, for example their patron-client linkages, are more likely to be linked and make coappearances than actors that do not share those characteristics. Stochastic equivalence is the idea that actors might have similar roles in the network, and thus be more or less likely to make appearances with common coalitions. If two elites in China are both proteges of Xi Jinping, then they are both more likely to make co-appearances with Xi and his other proteges, and less likely to make co-appearances with Xi’s rivals and his rivals’ proteges. Therefore, a systematic study of such indirect ties helps us to understand the complex interdependencies between elites and thus provides a more accurate answer to the question of “who are my friends.”

To sum up, in this study we propose to conceptualize the elite power-sharing as a latent space, which allows us to synthesize both of its positional attributes and relational dynamics. We further argue that we can approximate this latent space by examining how power foci (i.e., political events and elites’ appearance at them) are interconnected. Finally, we highlight the three who questions we need to address in this approximation. In the following parts, we introduce our empirical strategies and discuss how the approach could help shed light on the development of such informal institutions as the leading small groups.

### III Data

In this study, we rely on a unique database from the China Vitae project, which traces the public appearances of the CCP elites. We focus on the time period between January 1 2013 and January

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<sup>3</sup>The second-order dependency usually refers to reciprocity, which does not apply to our case here.

1 2017, and there are about 10,000 appearance records of over 200 elites. This allows us to systematically examine the elite power-sharing in Xi's first term. Table 1 presents a small sample of our dataset and reports the date, the event, and elites in attendance.<sup>4</sup> From Table 1, we can find our dataset captures how top CCP elites structured their power relationships via a variety of political activities, ranging from the civil-military unity meeting to the China-US summit. As argued above, these power foci constitute an interlocking network of events and elites, and Figure 1a shows how the six events in Table 1 could form a simple interlocking network. Since our main focus is elite relationship, we then extract the elite coappearance network as shown in Figure 1b, and such coappearance networks serve as the starting point of our later analyses (also see Figure 4).

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<sup>4</sup>Further information about the event locations, topics raised, and sources are also available.

Table 1: A selected sample of political events

Date	Event	Attendee
2013-01-25	Vice-Chairman of the Central Military Commission calls for efforts to promote unity among army, government and the people	Zhang Gaoli, Xu Qiliang
2013-02-07	Xi Jinping urges #CPC to accept criticism and be receptive to the views of non-communists	Xi Jinping, Li Keqing, Yu Zhengsheng
2013-03-18	Xi Jinping endorses work of Hong Kong #HK, #Macao governments #China	Xi Jinping, Zhang Dejiang, Li Yuanchao, Yang Jiechi
2013-04-14	Premier stresses foresight in economic policymaking #China	Li Keqiang, Zhang Gaoli, Ma Kai, Liu Yandong
2013-05-20	Chinese Premier visits memorial of Mahatma Gandhi in New Delhi #India #China	Li Keqiang, Wang Yi
2013-06-07	Xi, Obama meet for 1st summit #China #USA	Xi Jinping, Wang Yi
...	...	...

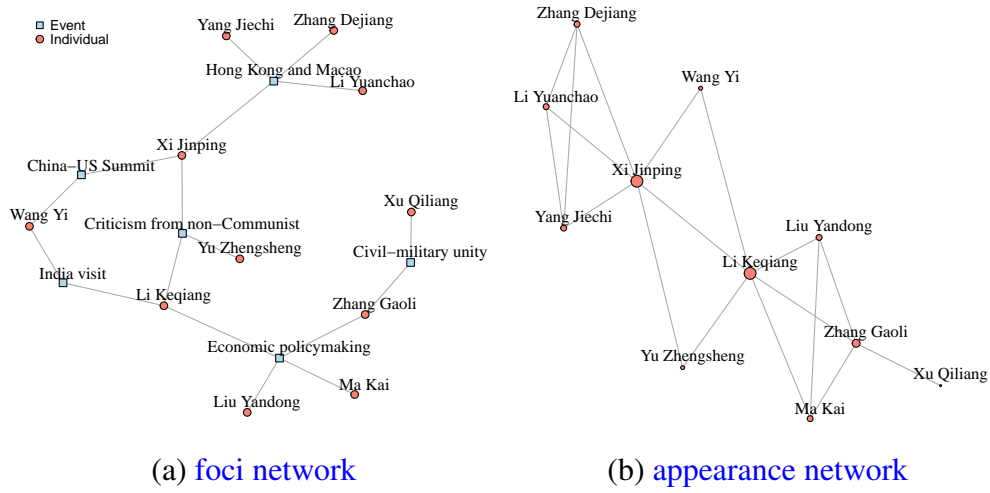


Figure 1: The interlocking networks of power foci

*Note: In subfigure (b), the node sizes are scaled to total appearances of individual elites.*

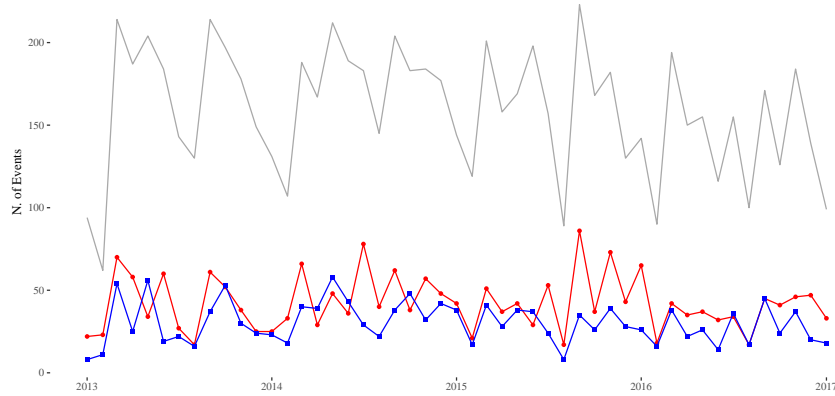
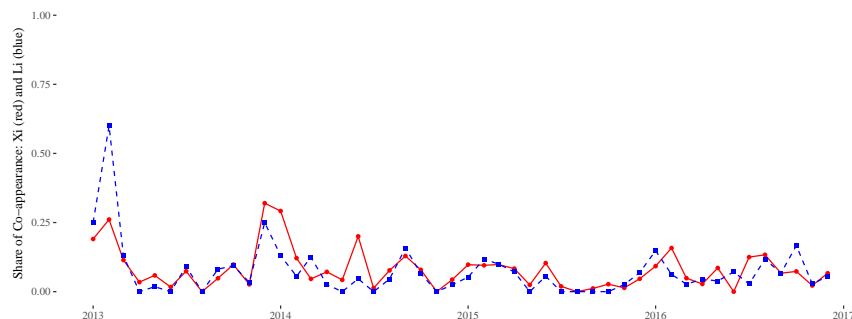


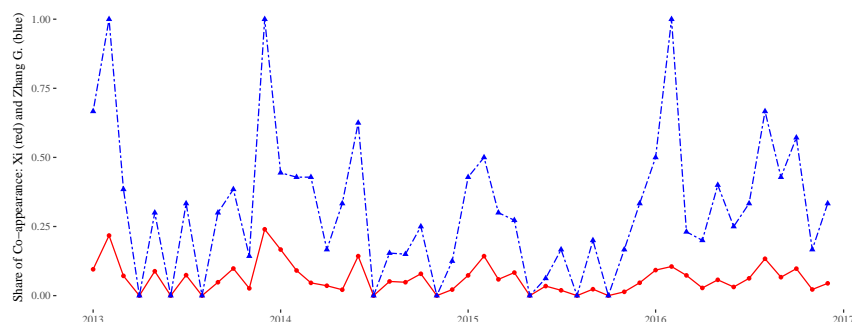
Figure 2: Total appearances (gray), Xi (red), and Li (blue)

After constructing the complete coappearance network, we can answer the questions of “who’s are in charge” and “who do I work with” by calculating elites’ total appearances and coappearances. Figure 2 plots the total number of elite appearances (gray), as well as those associated with Xi Jinping (red) and Li Keqiang (blue) respectively. A quick examination shows a consistent annual pattern. There are much fewer elite appearances in February and August, and their activities peak in March and September. While the low points in springs are mainly due to

the Chinese new year, those in August have a lot to do with the CCP's tradition of Beidaihe retreat [Miller \(2014c\)](#). A comparison of Xi and Li's appearances points to some interesting changes. In 2013 and 2014, we can find that their total appearances frequently intersected. Yet starting from 2015 Xi has made markedly more appearances. This corroborates with [Jaros and Pan \(2017\)](#) that Xi has significantly consolidated his power in his first term.



(a) Xi and Li



(b) Xi and Zhang

Figure 3: Coappearance

In Figure 3, we plot and contrast two pairs of coappearances, Xi-Li and Xi-Zhang.<sup>5</sup> In Figure 3a, while the red line indicates the share of Xi-Li coappearance to Xi's total appearance, and the dashed blue line denotes the share of their coappearance to Li's. From Figure 3a, we can find that the two lines intersected throughout the four years, and their shares of coappearances

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<sup>5</sup>Zhang Gaoli was one of the seven members of the Politburo Standing Committee, who also served as the first-ranked Vice Premier.

have declined over time. In other words, for both Xi and Li, their coappearances account for similar weights in their total activities, though they were gradually departing away from each other. However, Xi-Zhang coappearances in Figure 2b show a different trend. Xi-Zhang coappearances were highly asymmetrical. The share of their coappearance is markedly more salient for Zhang, indicating the extent to which Zhang is overshadowed by Xi.

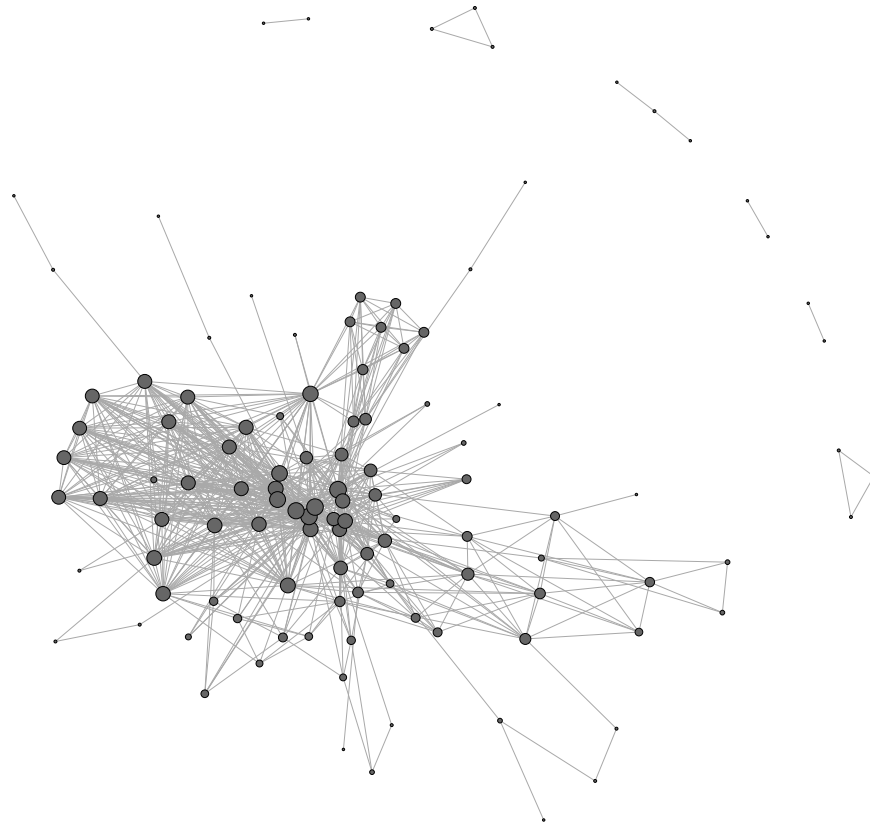


Figure 4: The complete coappearance network and high-dimensional dependencies  
*Note:* The node sizes are scaled to total appearance of individual elites.

Finally, we try to reveal high-dimensional dependencies among CCP elites by plotting the complete coappearance network in Figure 4. Further in Figure 4, we visualize the CCP elite coappearance network for the 18th and 19th Central Committees. The nodes within the visualization are sized proportionately to the number of ties they form. It shows what we can observe from this visualization is that the set of interactions occurring in the network form a



complex system. While there are a few actors towards the right-of-the-visualization that only appear with one or two other actors, most fall into the broader interconnected system at the left of Figure 4. Further-evenMoreover, -within thisthe broader interconnected systemcomponent, we see can find notable higher order structures like triangular relationships that cannot be addressed by examining dyadic ties. There are some actors that are highly central to the network and then groups of actors that form around them. If we were to simply study the direct ties, that actors share we would not be able to account for this structure. One way of calculatingto quantify the level-of-such higher order structures -that exists in this network-is via a-the transitivity statistic.<sup>6</sup> Specifically,Here we utilize the clustering coefficient, which is a measure of the degree to which nodes in a graphnetwork-tend-to cluster together.<sup>7</sup> If there is truly-aA significant amount of higher order structures that simply using a direct ties approach would miss, then we would expect thisusually lead to a high clustering coefficient-to-be-quite-high. In our case of For the CCP elite coappearance network-shown-in-Figure-4, we find that thisthe statistic is equal-to-0.67 on a scale from 0 to 1, where 0 would indicate little higher order clustering-indicating a high degree of higher order dependencies. Thus if one were to simply utilize the number of direct ties as a measure of how actors related to one another in this network they would be discarding a great deal of useful information that may speak to latent coalitions within the network. In the following section, we discuss our approach to systematically estimate the-propensity-forlatent affinities between actors -relate-to-one-another-in-this-networkin a network with higher order dependencies.

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<sup>6</sup>A relation between a set of actors is transitive (i.e., a triangular relationship), if every time that  $i$  and  $j$  have a tie and  $j$  and  $k$  have a tie, then  $i$  and  $k$  will have a tie.

<sup>7</sup>The clustering coefficient is calculated as follows, where  $G$  represents the network being studied,  $C = \frac{tr(G^3)}{\sum_{i \neq j} (G^2)_{i,j}}$ .

## IV Latent Factor Analysis

To answer the question of “who are my friends,” we utilize a latent factor model (LFM) (Hoff, 2005; Minhas, Hoff and Ward, 2016). LFM positions actors in a  $k$  dimensional latent vector space based on third order dependence patterns. In this space, actors whose vectors point in similar dimensions are more likely to share similar preferences and be members of the same latent coalitions. The angles between these vectors then provides a measure of the extent to which the preferences and factional links are similar. Given its ability to capture latent affinities between interconnected actors, LFM has been used to infer state foreign policy preferences (Gallop and Minhas, 2018).

More formally, we conduct the analysis as follows. We treat our coappearance network as an  $n \times n$  matrix, where  $n$  denotes the number of elites, and the matrix cell  $y_{ij}$  represents the number of coappearances between elite  $i$  and elite  $j$ .<sup>8</sup> To obtain the latent affinities between elites (i.e., a lower-dimension relational measure), we then have an LFM as follows,

$$Y = f(\theta) \tag{1}$$

$$\theta = \beta^\top \mathbf{X} + Z \tag{2}$$

$$Z = M + E \tag{3}$$

$$M = U\Lambda U^\top \tag{4}$$

where  $u_i \in \mathbb{R}^k$  and  $\Lambda$  is  $k \times k$  diagonal matrix.  $f(\cdot)$  is a general link function corresponding to the distribution of  $Y$  (in our case the coappearance count), and  $\beta^\top \mathbf{X}$  is the standard regression term for dyadic and nodal fixed effects.<sup>9</sup>

The LFM accounts for network interdependencies is by decomposing the error term  $Z$ . Hoff

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<sup>8</sup>It should be noted that the coappearance data is symmetric and so  $y_{ij} = y_{ji}$  for all  $i, j$ . The approach we describe below has already been generalized to the case where  $y_{ij} \neq y_{ji}$ .

<sup>9</sup>For the purpose of parsimony we abstain from using fixed effects in this study.

(2008) notes that we can write  $Z = M + E$ , where the matrix  $E$  represents noise, and  $M$  is systematic effects representing first and third order dependencies. We factorize the multiplicative effects into the product of two simpler matrices,  $U\Lambda U^\top$ . Under this framework a vector of latent characteristics are thus estimated for each actor,  $u_i = \{u_{i,1}, \dots, u_{i,k}\}$ . Similarity in the latent factors between two actors,  $u_i \approx u_j$ , corresponds to how stochastically equivalent they are and the diagonal entries in  $\Lambda$ ,  $\lambda_k > 0$  or  $\lambda_k < 0$ , determine the level of homophily (or anti-homophily) in the network (Minhas, Hoff and Ward, 2016).

For our interest in latent affinity, the key output is  $U\Lambda U^\top$ , where  $U$  is an  $n \times k$  matrix that represents each actors vector in the  $k$ -dimensional latent network. ~~This matrix provides~~ It captures the effect of stochastic equivalence and homophily on official appearances. ~~We can look at the matrix  $U$ , an  $n \times k$  matrix that represents each actors vector in the  $k$ -dimensional latent network.~~ But a caveat in interpreting this space is that it is non-Euclidean, as the actor vectors are embedded within a  $k$ -dimensional hyper sphere. ~~, and so w~~ We thus cannot simply ~~look at~~ use distances in this space ~~as a measure of latent affinities~~. Rather, the important measure here is an actor's vector in this space, and the similarity between the vector of one actor and another. Comparing the similarity ~~of preferences~~ between two elites,  $\{i, j\}$ , can be accomplished by comparing the direction to which their respective factor vectors point. A commonly used metric for this sort of problem ~~in the recommender system literature from computer science~~ is the cosine of the angle formed by the latent vectors of both actors.<sup>10</sup> We refer to this distance metric as latent angle distance. ~~Thus~~ More concretely, if the estimated latent vectors of two actors are in the same direction, they are apt to have made appearances with similar partners. We measure this by looking at the absolute distance of the angles created by each officials position and the center of the latent network, ~~and the results are plotted in Figure 5 in a given year.~~

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<sup>10</sup>The method is well developed in the recommender system literature of computer science. ~~This can be calculated~~ It is calculated in the following way, where  $u$  represents the  $n \times k$  matrix of actor vectors, Latent angle distance  $_{ij} = \frac{u_i \cdot u_j}{||u_i|| \cdot ||u_j||} * (-1)$ .

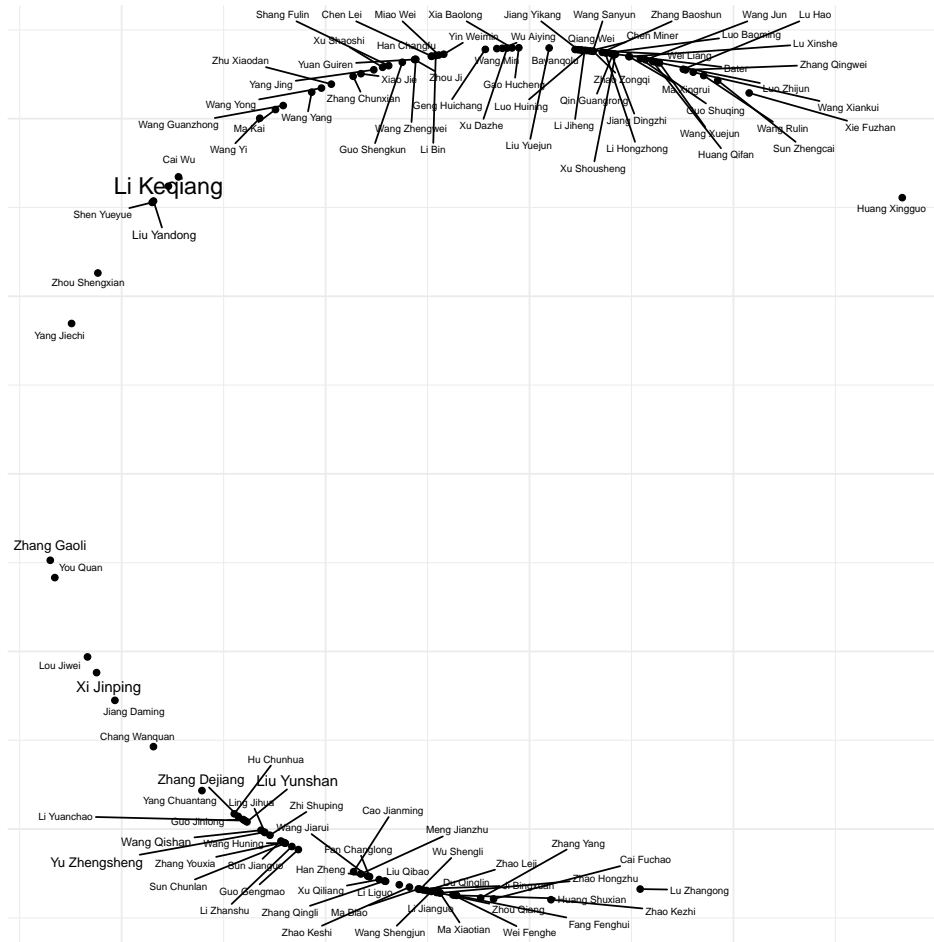


Figure 5: Visualization of the AME latent factor space

*Note:* Actors that cluster together in this space are more likely to interact with one another.

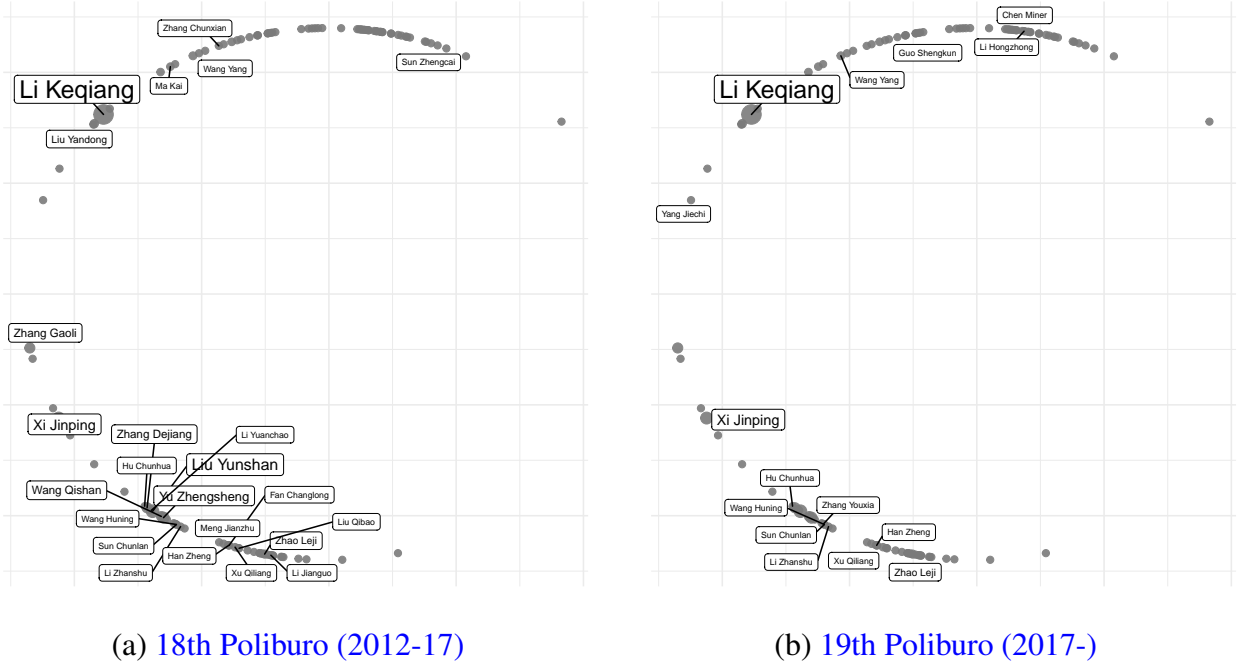


Figure 6: Slices of the latent factor network with key actors highlighted from the 18th and 19th Politburo

In Figure 5, we can find CCP elites in our datasets fall into two clusters that are centered around Xi (i.e., the lower cluster) and Li (i.e., the upper cluster). To gain a better view about the relationship between key elites, we present the slices of Politburo members of the 18th and 19th Central Committee in Figure 6. First, consistent with Figure 5, the 18th Politburo members as shown in Figure 6a are also divided into the two clusters. More interesting, while the other three Vice Premiers (i.e., Liu Yandong, Wang Yang, and Ma Kai) are sided with Li, the first Vice Premier Zhang Gaoli is much closer to Xi. Second, in contrast to Figure 5 where more elites are found in the upper cluster, the majority of Politburo members in Figure 6a are clustering around Xi. Particularly, the two military members, Xu Qiliang and Fan Changlong, are also in the lower cluster. This dominant Xi cluster is consistent with findings of Jaros and Pan (2017). Third, Figure 6a also points an outlier elite in the upper left corner, Sun Zhengcai, who is a remote member of the Li cluster. However, Sun is almost diagonal to Xi, that is, a position farthest possible to Xi in the latent space. Our data point stop on January 1st 2017, and seven months later

Sun was abruptly removed from his office as the party secretary of Chongqing. Finally, Figure 6b plots members of 19th Politburo who were elected over ten months after our last data point. It shows that how this approach is able to pick up potential changes in the Politburo. Together, the above findings suggest our approach suffice to meet satisfactory face validity.

## V Leading Small Groups

To further test the validity of our ~~measures~~ approach, we ~~attempt to estimate~~ examine elite appointments in the Leading Small Groups (LSGs) ~~using measures of latent similarity we discuss above~~. Following Huhe and Stepan (2018), ~~In this study we examine~~ focus on LSGs at the national level ~~as well as their members, that is, and we further differentiate between~~ the Central Committee (CC) LSGs and the State Council/Central Government (SC) LSGs. (~~zhongyang lingdao xiaozu, hereafter CC LSGs~~) and the State Council Leading Small Groups (~~guojia, quanguo, guowuyan, or zhongguo lingdao xiaozu, hereafter SC LSGs~~). All LSGs play a pivotal role in gluing the fragmented CCP regime together (Hamrin, 1992). As an informal arrangement, LSGs is less restrained by formal regulations and can be strongly influenced by the elites who preside them. An LSG creates an enormous confluence of leadership over various state apparatuses within one small body. Recognizing this, Lieberthal (1992) argues that “at [the national] level, the [LSG] system is highly personal. ... There is ... a great deal of informal contact and maneuvering, with control over the various ‘leading groups’ an important prize in the political jockeying in the capital” (p. 14). Huhe and Stepan’s (2018) study of LSGs in Xi’s first term also reveal that the appointments in CC and SC LSGs are highly skewed. While a majority of LSGs appointees are affiliated with only one LSG, a few elites concurrently sit in different LSGs. And this trend is particularly evident in CC LSGs. Figure 7 then shows how 242 CCP elites are linked via 19 CC LSGs and 16 SC LSGs (Batke and Stepan, 2017; Huhe and Stepan, 2018).

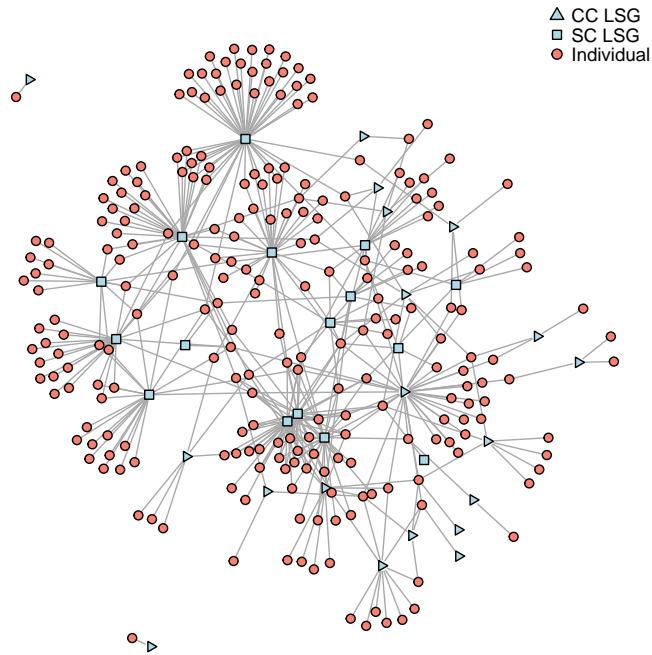


Figure 7: The Central Committee (CC) and the State Council (SC) LSGs

Given that Chinese elites can be members of multiple LSGs, and that we have reason to believe that since more powerful CCP elites are more likely to be affiliated with more members of the party are in more of these groups LSGs, we start by using a count model of LSG membership, in particular a negative-binomial regression. We compare three main models in accordance with our three “who” question. Our null baseline model looks simply at the individual elites’ total level of appearances in the Chinese Vitae data. This provides an approximate measure of popularity at the individual level (i.e., “who are in charge”). The second model includes both total appearances and coappearances with Xi Jinping, attempting to capture impacts of the direct dyadic relationship with the Chairman of the party joint activities with Xi on LSG appointments (i.e., “who do I work with”). Finally, our main model includes overall appearances, and rather than looking at appearances with Xi, we then turn to look at the latent angle distance an elite has with Xi, which gets at not only their direct interactions, but also captures such higher third order effects like as homophily and stochastic equivalence (i.e., “who are my friends”).

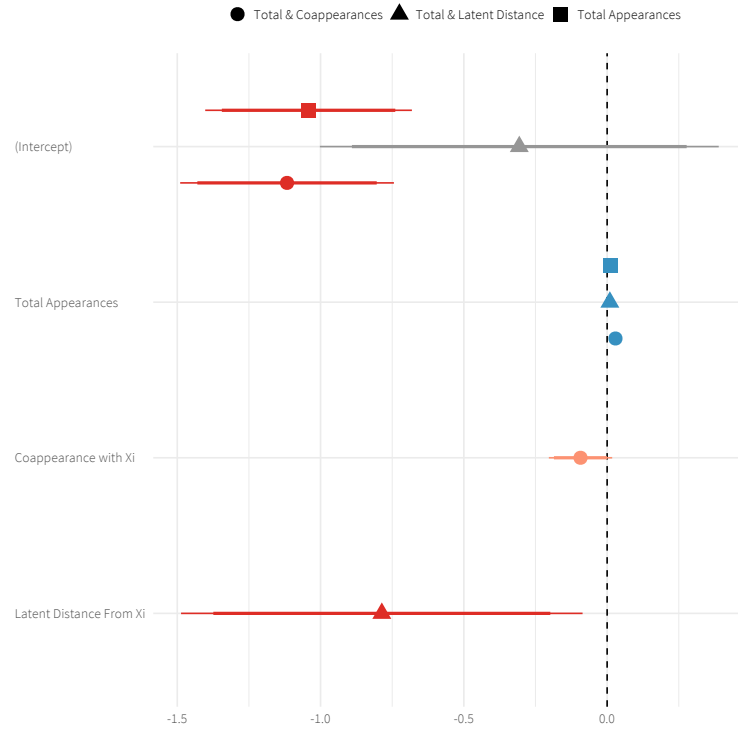


Figure 8: Negative binomial regressions on appointment to LSGs

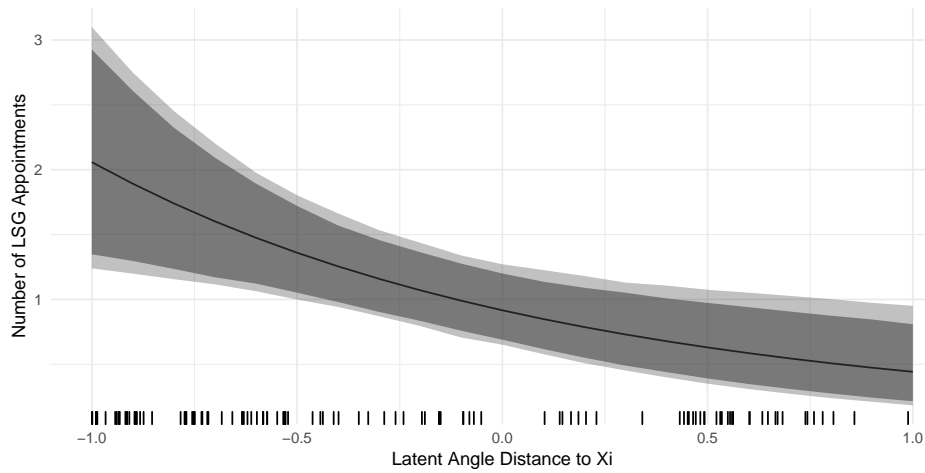


Figure 9: Estimated effect on number of LSG appointments based on latent distance to Xi

The results of the three our first three models are reported in Figure 68. First, our baseline model (square) suggests that elites' total appearances matter in LSG appointments. Those “who



are in change” do attend more LSGs. Second, as shown in the coappearance model (circle), simply joining Xi in same political events (i.e., those “who work with Xi”) does not make CCP elites with “who work with Xi” more likely to be appointed in LSGs. This confirms our earlier discussion that “who do I work with” could run into two types of errors and mask the latent affinities between elites. Finally, in contrast to coappearances, ~~Interestingly, while coappearances with Xi do not have a robust relationship to placement on more LSGs,~~ the latent distance measure is significant and in the predicted direction. —~~e~~Elites who are ~~further from~~closer to Xi in the latent space (i.e., those “who are Xi’s friends”) are seated on more LSGs~~Leading Small Groups~~. Moreover, when we take into account latent proximity to Xi, total appearances cease to matter, whereas they have the predicted positive effects in the other two models. In Figure 7 we show the expected number of LSGs an elite with an average number of total appearances would be appointed to based on their latent distance from Xi, for that elite, moving from the closest angle distance observed to the furthest is associated with a drop in LSG appointment of about 1.5.

Table 2: Out-of-sample performance on scoring rule metrics for Figure 8

Model	Logarithmic	Brier	Spherical	Dawid Sebastiani	RMSE
Total appearance model (1)	1.77	-0.36	-0.64	2.70	1.89
Total appearance and coappearance model (2)	1.77	-0.38	-0.66	2.65	1.84
Total appearance and latent distance model (3)	1.73	-0.46	-0.86	2.66	1.74

*Note:* For each of the metrics, lower values indicate better performance. For more details about scoring rules, see the Appendix.

While our measure of Chinese latent proximity conforms to our theoretical expectations in terms of conventional statistical significance, an important test is whether it improves our ability to predict behaviors out of sample. To do this, we divide Chinese elites into 20 groups at random, and in each case predict how many LSGs an elite in that group will be appointed to using a model fit on the other 19 groups. We do this for each of our three main models and report performance metrics in Table 2. ~~As you can see in Table 2,~~ We can find the model using latent angle difference

significantly outperforms the models that only use total and coappearances, showing that this measure of latent distance helps us to predict promotion to the Leading Small Group.

Provided with the two clusters as shown in Figure 5, we further model LSG appointments. Additionally, we attempt to look at models based on distance, not to Xi Jinping, but to Li Keqiang, and the results are presented in Figure 10, to see how well individuals closer to Xi's rival perform in terms of appointment to these groups. We find that latent distance from Li, as depicted in Figure 8, is similarly associated with a lower probability of appointment to LSGs. However, combining the two distance measures results in a model that has ambiguous effects. ~~and this is in part because~~ One reason is that for most members of the party, distance from Xi and Li are highly collinear. Importantly however, they differ for some individuals. However, as depicted in Table 3, inclusion of latent distance to Li ~~Keqiang actually results in a worse performing model~~ does not necessarily model performance out of sample. This implies that, for elites where their whose distances to Xi and Li diverge ~~(because they are between them in the latent angle space)~~, adding information about proximity to Li actually hurts the model's performance. ~~This might be because Xi has such a dominant hand in determining advancement in the party.~~

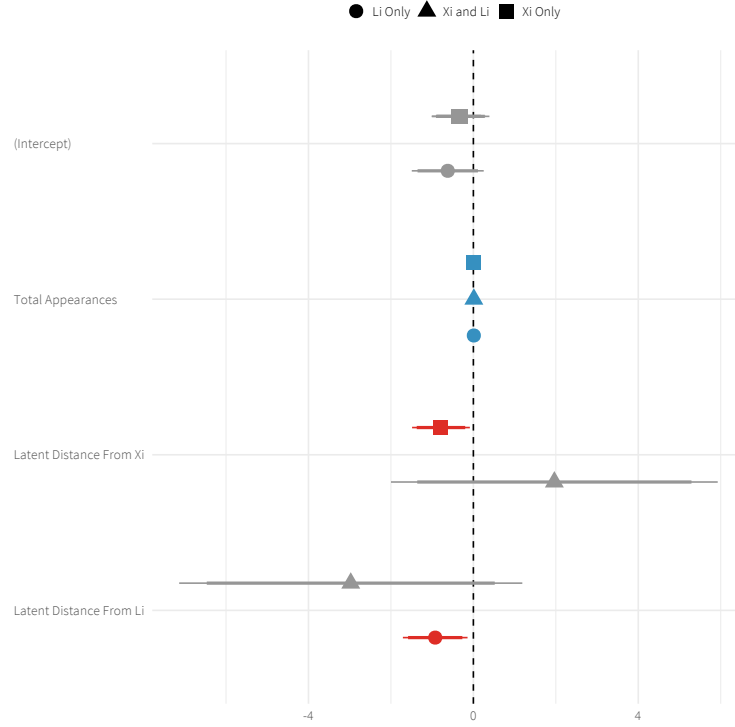


Figure 10: Negative binomial regressions on appointment to LSGs by relationship to Xi and Li

Table 3: Out-of-sample performance on scoring rule metrics for Figure 10

Model	Logarith	Brier	Spherical	Dawid	
				Sebastiani	RMSE
Total appearance with latent distance, Xi (3)	1.73	-0.46	-0.86	2.66	1.74
Total appearance with latent distance, Li (4)	1.64	-0.51	-0.96	2.41	1.90
Total appearance and latent distances, Xi and Li (5)	1.74	-0.51	-1.07	2.62	1.85

Table 4: Bivariate probit analyses of CC and SC LSGs

	Model 6		Model 7		Model 8		Model 9		Model 10	
	CC	SC	CC	SC	CC	SC	CC	SC	CC	SC
Total appearances	0.06*** (0.02)	0.002 (0.003)					0.05*** (0.02)	-0.0005 (0.003)	0.06*** (0.02)	-0.002 (0.003)
Latent distance to Xi			-1.19*** (0.27)	-0.27 (0.22)			-0.62** (0.29)	-0.26 (0.23)		
Latent distance to Li					-0.78** (0.32)	-1.81*** (0.39)			-0.34 (0.36)	-1.86*** (0.40)
Intercept 1	-1.08*** (0.18)		-0.94*** (0.18)		-0.77*** (0.17)		-1.20*** (0.19)		-1.19*** (0.21)	
Intercept 2	-0.65*** (0.14)		-0.69*** (0.14)		-1.36*** (0.23)		-0.70*** (0.15)		-1.34*** (0.23)	
Intercept 3	0.91** (0.40)		0.90** (0.38)		0.51 (0.37)		0.93** (0.02)		0.91** (0.44)	

Note:

\* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

Finally, as emphasized by Huhe and Stepan (2018), there are marked structural differences between CC LSGs and SC LSGs. While CC LSGs is highly centralized, reflecting Xi's power grip the party, SC LSGs are far more decentralized and driven more by specific needs of policy collaboration. Of course, not all LSGs are the same. There are groups at the State level and at the Central level. Based on institutional setup, while Xi has the final say on appointments to the Federal LSGs, Premiere Li Keqiang is responsible for the state level ones. Thus, to account for these differences, we run a bivariate probit analysis, which simultaneously estimates the likelihood that an elite will be appointed to any Central or State CC or SC LSGs joints. Again in this analysis, latent distance from Xi has a consistent negative effect for both types of LSGs. From Table 4, we can find latent distance from Xi has a consistent and negative effect on the likelihood of appointment to CC LSGs, but there is no clear effect on SC LSGs. Conversely, distance from Li is associated with a lowered likelihood of appointment to SC LSGs, but not the CC ones. The ability to distinguish between promotion to CC and SC LSGs renders more support for our

approach to approximating the latent affinities between CCP elites.

## VI Conclusion and discussion

Lacking strong and binding institutional rules, elite politics in authoritarian regimes tend to be opaque and volatile. This in turn introduces great difficulties for us to understand elite power-sharing where it is most needed. Particularly, as part of the global rise of strongman politics, Chinese politics under Xi has become less institutionalized and more personalist. ~~The institutional limit on leadership terms has been eliminated, and Xi has centered power in his hands, and the hands of his allies. Given these developments, it is crucial to understand and measure factions and affinity within Chinese elites.~~ To better understand these developments, ~~In this study,~~ we propose a latent ~~network approach to explore the dynamic interactions of the CCP elites~~ space framework. We treat elite power-sharing as a latent space, and we argue that we can approximate this space by studying elites' appearances in various political events (i.e., power foci). Specifically, we highlight three crucial questions in this approximation, i.e., who are in charge, who do I work with, and who are my friends. ~~We conceptualize public co-appearances as "foci," around which various political activities are organized. Since elites' engagement in these foci is highly selective, their co-appearances signal important information about elites' collusion and cooptation. Based a unique dataset~~ After applying the latent factor model to the appearance data of CCP elites, we are able to capture ~~, we aim to answer three critical questions — 1) who's in charge, (2) who do I work with, and (3) who are my friends — by examining~~ elites' total appearances, dyadic coappearances, and, most importantly, ~~finally~~ their latent network distance. We further examine how this approach could improve our understanding of such pivotal informal institutions as LSGs. ~~We~~ Our tests show that ~~find that~~ the latent network distance greatly improves our prediction of LSG appointments. It ~~proximity to Xi corresponds to policy prominence for Chinese elites. Most excitingly, we find that this latent measure~~ significantly outperforms measures that simply look at individual power

(who's are in charge) and dyadic relationships (who do I work with). As an additional demonstration of the measure's efficacy, we also find that it helps reveal CCP's more nuanced power-sharing arrangements. While the proximity to Xi helps to explain LSGs of the Central Committee, it is the latent distances from Li that better explain those of the State Council.

By introducing an integral framework, our study presents a possible avenue to synthesize different aspects of elite power-sharing in authoritarian regimes. It not only encompasses positional status of individual elites, but also incorporates how they are interrelated. This allows us to develop a systematic view about the inherent and uneasy tensions among authoritarian elites. As long noted by Pye (1995), "Chinese politics operated in an atmosphere of tension in which everyone sensed the need always to be careful and calculating about what was done or said" (p. 36). The three who questions proposed in this study then help highlight their key heuristics. Particularly, our emphasis on the question of "who are our friends" suggests that we need to move beyond direct dyadic relationships and explore the more nuanced and subtle higher order dependencies. ~~While we believe that this measure has aided us in our understanding and measurement of the Chinese political system, we can further improve our understanding in a few ways. First, this data can not only be compared to biographically and media measures of elite prominence, but in fact, the technique can incorporate these factors to gain a more nuanced understanding of elite networks and relationships. Secondly, we believe this technique can be expanded beyond China, to help us understand factional politics in other, even more opaque autoeracies, such as North Korea or the Kingdom of Saudi Arabia.~~

Studies of elite politics in authoritarian regimes have also been long plagued with data paucity. Our study points to an alternative data source, appearance data, that could complement existing data like media coverage and biographical archives. Such data not only is dynamic, it also sheds light on the actual realization of power relationship as emphasized by Dahl (1961). As a preliminary exploration, our study is inevitably limited, and more systematic are called for to improve collection and analysis of such data.

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