

Who’s 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 elite power-sharing in authoritarian regimes: (1) who’s in charge, (2) who do I work with, and (3) who are my friends. We empirically assess the three questions by computing elites’ total appearances, dyadic coappearances, and their latent network distance using a latent factor network analysis of about 10000 appearance records of over 200 top CCP elites from 2013 to 2017. 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.

*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.¹ We also introduce a new type of data

¹To 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 in charge, (2) who do I work with, and (3) who are my friends. The question of "who's 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"

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’s 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.

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 using “power elite” debates. 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.² 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 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

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

and probe links across 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, 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.

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 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 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 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.³ Unlike first-order dependencies that are associated with attributes of individual actors, such high-dimensional dependencies usually arise from mechanisms like 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 answer 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 LSGs.

Data

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

³The 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.⁴ 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 1.a shows how the six sample events in Table 1 could form a simple interlocking network. Since our main focus is elite relationships, we then extract the elite coappearance network as shown in Figure 1.b, and this coappearance network serves as the starting point of our later analyses.

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
...

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

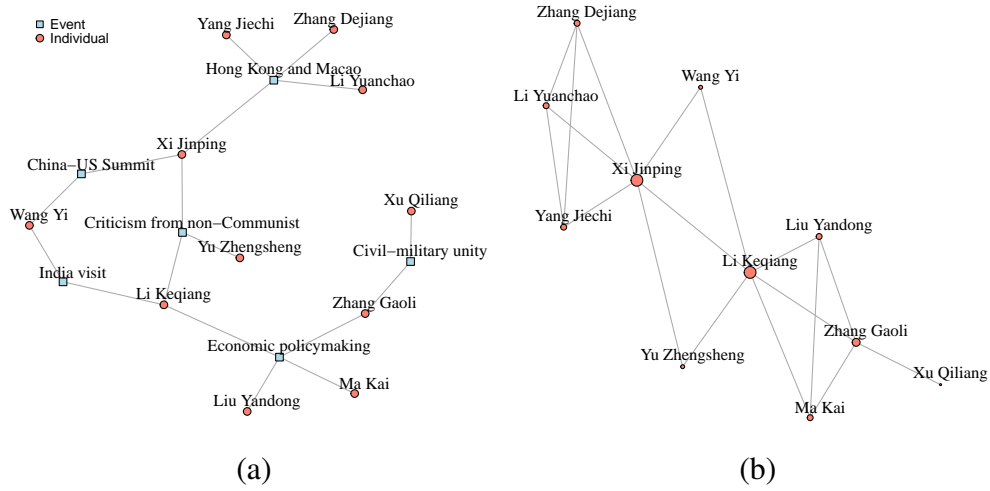


Figure 1: The interlocking networks of power foci

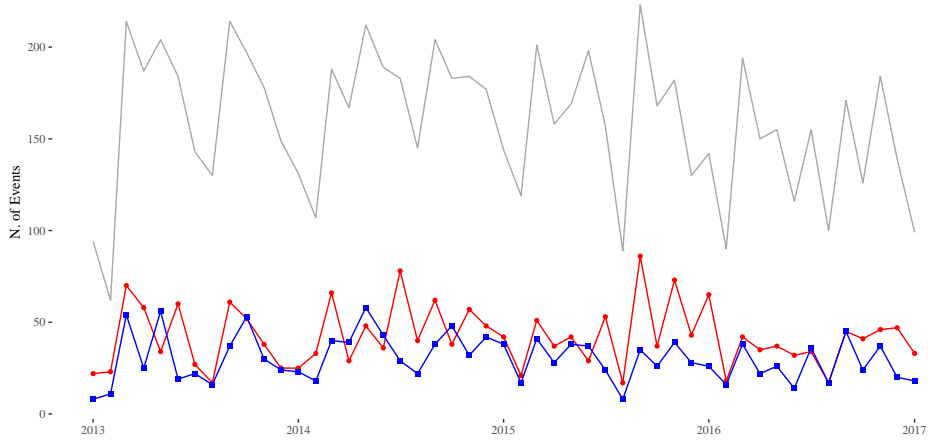
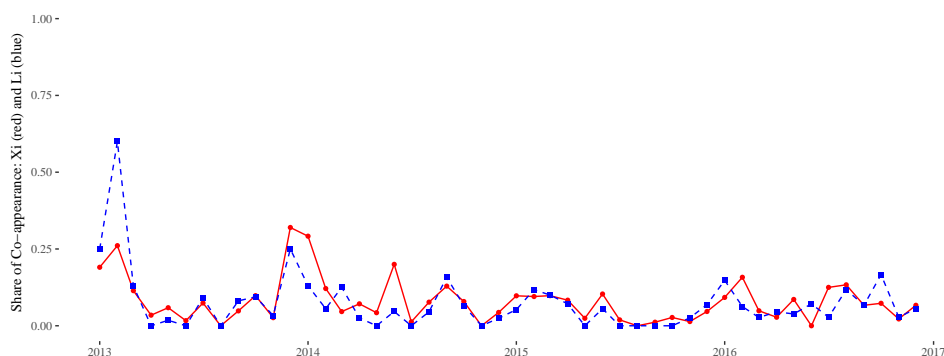


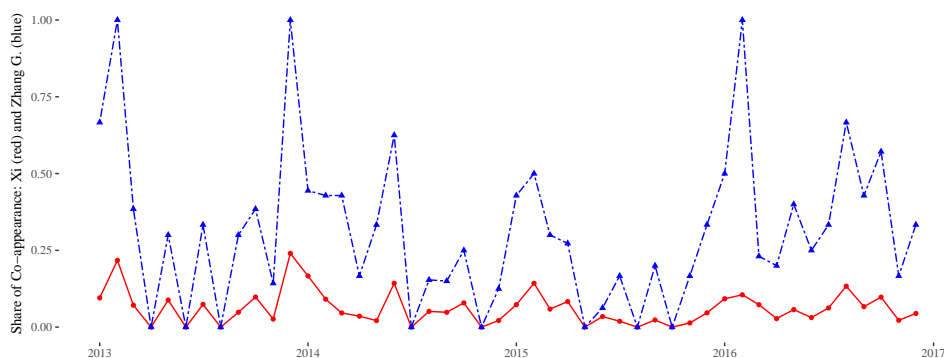
Figure 2: Total appearances (gray), Xi (red), and Li (blue)

After constructing the complete coappearance network, we can answer the questions of “who’s in change” 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.⁵ In Figure

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

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 3.a, we can find that the two lines intersected throughout the four years, and their shares of coappearances 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.

[Discussion of triadic dependence: insert figures/dvViz.pdf here ... feels like an appendix item][You are right. I'm not sure how we should do here. Or shall we contrast the transitivity/clustering of our data with simulated data? After all, this is one of our main selling point]

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. What we can observe from this visualization is that the set of interactions occurring in this 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 even within this broader interconnected system we see notable structure. 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 calculating the level of higher order structure that exists in this network is via a transitivity statistic.⁶ Specifically, we utilize the clustering coefficient, which is a measure of the degree to which nodes in a graph tend to cluster together.⁷ If there is truly a significant amount of higher order structure that simply

⁶A relation between a set of actors is transitive, 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.

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

using a direct ties approach would miss, then we would expect this clustering coefficient to be quite high. For the CCP elite coappearance network shown in Figure 4, we find that this statistic is equal to 0.67 on a scale from 0 to 1, where 0 would indicate little higher order clustering. 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 for actors relate to one another in this network.

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 .⁸ To obtain the latent affinities between elites (i.e., a

⁸It 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 $y_{ij} \neq y_{ji}$.

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 Λ 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.⁹

The LFM accounts for network interdependencies is by decomposing the error term Z . Hoff (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 Λ , $\lambda_k > 0$ or $\lambda_k < 0$, determine the level of homophily (or anti-homophily) in the network (Minhas, Hoff and Ward, 2016).¹⁰

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

¹⁰A Bayesian procedure to estimate the LFM is available in the `amen` R package.

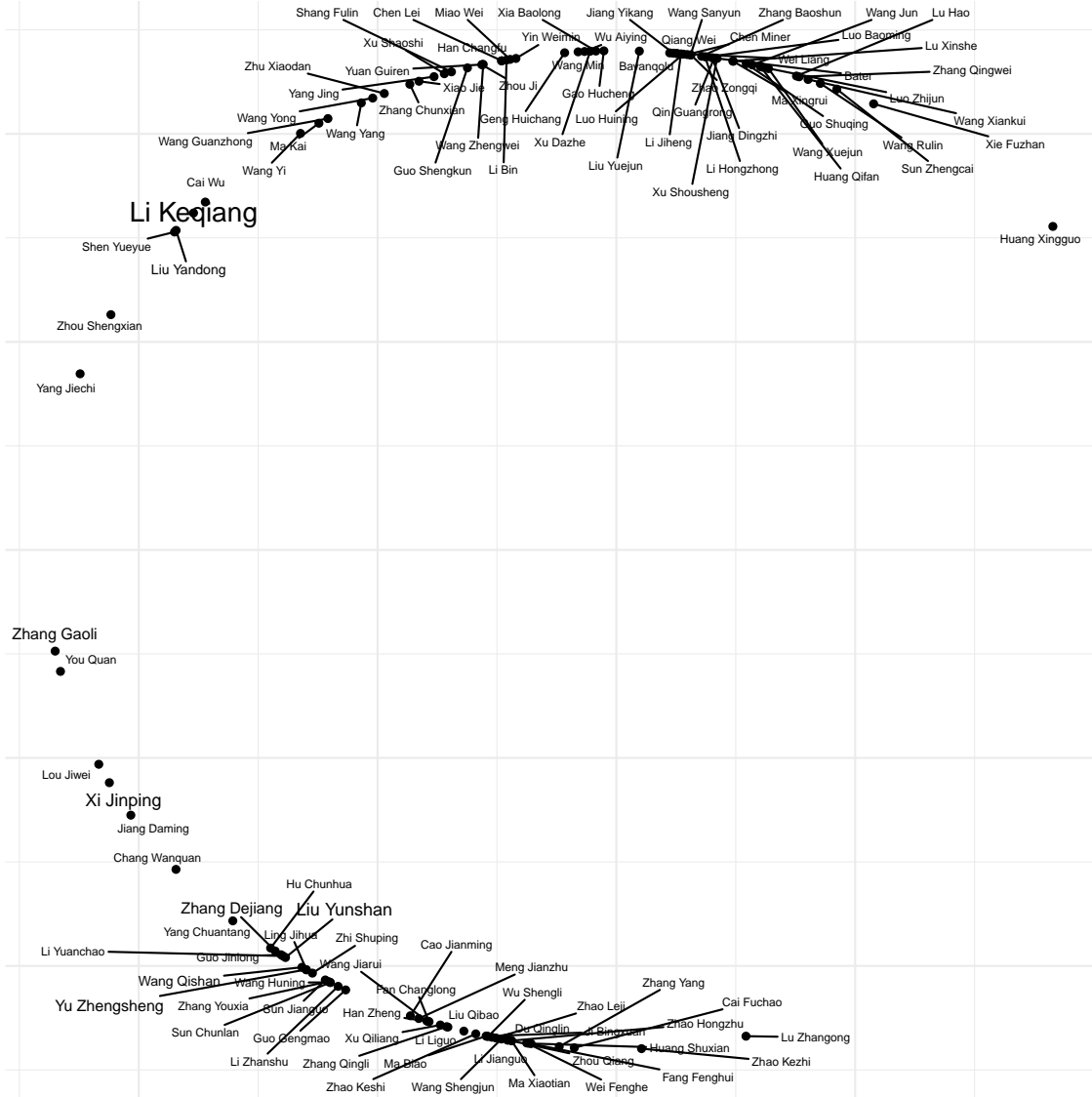


Figure 4: Visualization of the latent factor space generated by AME. Actors that cluster together in this space are more likely to interact with one another.

For our interest in latent affinity, the key output is $U\mathbf{A}U^\top$. This matrix provides 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 we cannot simply look at distances in this space. 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.¹¹ We refer to this distance metric as latent angle distance. Thus, 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 in a given year.

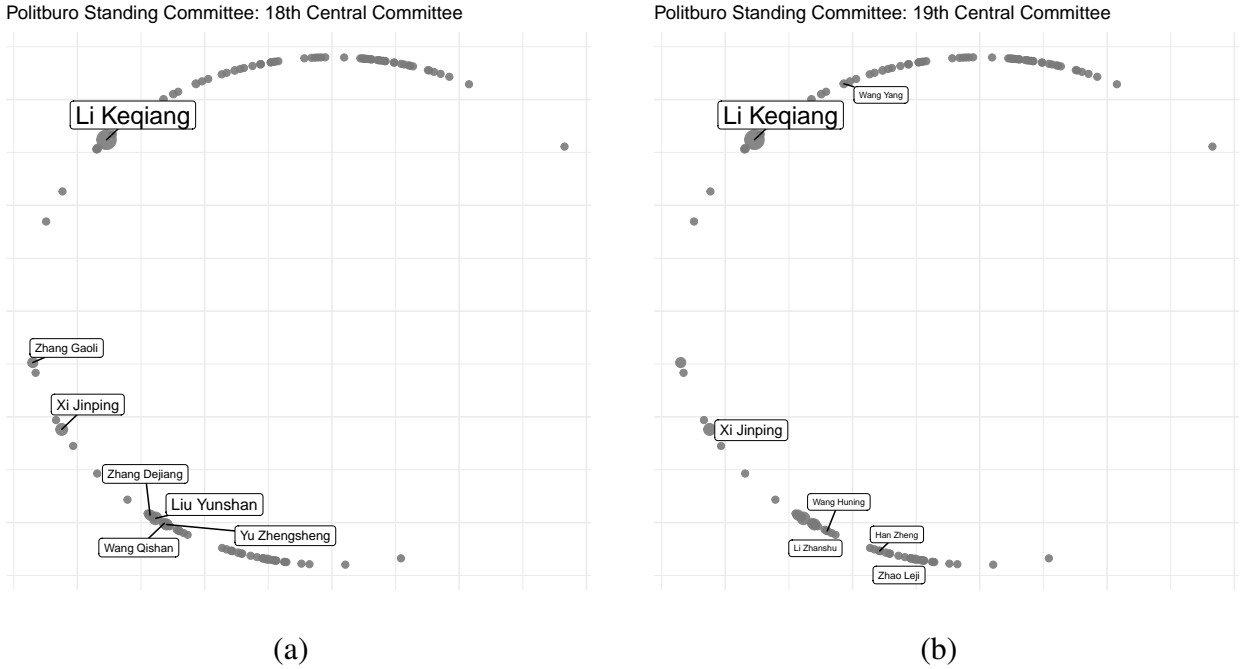


Figure 5: Slices of latent factor network depicted in Figure 4 with key actors highlighted from the 18th and 19th Politburo Standing Committees.

[Key elites stand out. Some interesting pattern of power-sharing has emerged: two clusters.

¹¹This can be calculated in the following way, where u represents the $n \times k$ matrix of actor vectors, Latent angle distance $_{ij} = \frac{u_i \cdot u_j}{||u_i|| \cdot ||u_j||} * (-1)$.

While there are more individuals in our dataset closer to Li, more politburo members sit closer to Xi. It is consistent with studies like Jaros and Pan]

[For the incoming Politburo of 19th central committee]

Appointments in Leading Small Groups

To test the validity of our measures, we attempt to estimate elite appointments in the Leading Small Groups (LSG) using measures of latent similarity we discuss above. In this study we examine LSGs at the national level as well as their members, and we further differentiate between the Central Committee (*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 are involved in the collecting and providing policy intelligence, and coordinate among different stakeholder interests. However, only a small share of them have coordination (*xietiaozu*) in their name. The ones that do, often include stakeholders that are strictly speaking outside of the party-state bureaucracy, such as business associations.

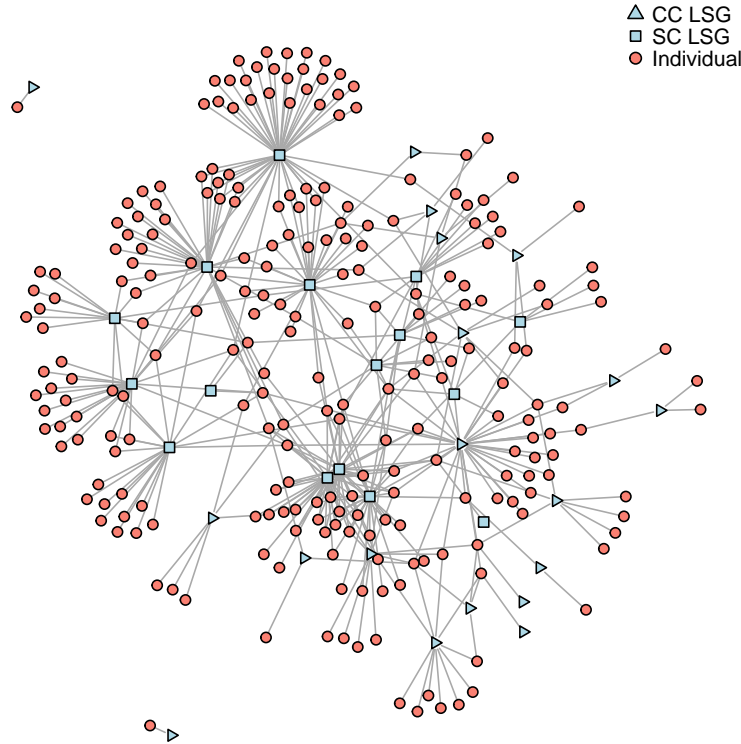


Figure 6: Leading small group at the national level

[Max and i were confused about what figure is being referenced in the paragraph below][Sorry. I have updated the figure and chose to present CC LSG and SC LSG in one graph]

Fig. 4a plots our data of Party LSGs. It shows how 77 CCP elites (red circle points) are linked with 19 Party LSGs (blue rectangle points) via 110 affiliation ties. Given the duality nature of the bipartite network, we can further project the bipartite network of Party LSGs into two one-mode networks, a LSG network and a member network. We then plot our data of State LSGs in Fig. 4b. The bipartite network of State LSGs encompasses 188 individuals, 16 State LSGs, and 312 unique entries of affiliation relationship. 242 individuals, 19 CC LSGs, and 16 SC LSGs

[also since it looks like the degree distributions have been taken out the paragraph below should probably be removed as well]

In revealing the general pattern of how nodes are interconnected, degree distribution perhaps is the most basic graph-level statistic. Scholars have long relied on degree distribution to identify

different network typologies (e.g., [Albert and Barabási, 2002](#); [Clauset, Shalizi and Newman, 2009](#)). Yet, a bipartite graph complicates its calculation and interpretation since two types of degree distributions are available, one for elites (i.e., “how many LSGs an elite is appointed to”) and one for LSGs (i.e., “how many members a LSG is consisted of”). Here we are interested in the extent which elites are assigned to multiple LSGs, and Fig. 5 plots degree distributions respectively. An examination of Fig. 5a shows the Party LSG network differs significantly from a random network in three ways. First, there are much more nodes with low degrees in the Party LSG network. Specifically, the Party LSG network deviates from a random one in its systematic control over membership concurrency. Most elites are assigned to a single LSG, and only a few are appointed to multiple LSGs. Second, while a random network lacks hub nodes with high degrees, the Party LSG network has a few central nodes. Finally, differing from random network, the Party LSG network has a much smaller number of nodes with middle range degrees. In contrast, the State LSG network deviates from random networks only in its larger number of low-degree nodes. Together, these findings suggest that compared to that of the State LSG network, the degree distribution of Party LSG network is more like a fat-tail one, which is usually the hallmark characteristic of the centralized scale free network.

[should some justification be provided here for why we are at looking lsgs in total?]

Given that Chinese elites can be members of multiple LSGs, and that we have reason to believe that more powerful members of the party are in more of these groups, we start by using a count model of membership, in particular a negative-binomial regression. We compare three main models. Our null model looks simply at the individuals total level of appearances in the Chinese Vitae data, this provides an approximate measure of popularity at the individual level. We also look at a measure that includes both total appearances and coappearances with Xi Jinping, attempting to capture the direct dyadic relationship with the Chairman of the party. Finally, our main model includes overall appearances, and rather than looking at appearances with Xi, we look at the latent angle distance an elite has with Xi, which gets at not only their direct interactions, but also third order effects like homophily and stochastic equivalence.

Table 2: Negative binomial regressions on appointment to leading small groups.

	Total Appearances	Total & Coappearances	Total & Latent Distance
(Intercept)	−0.02 (0.16)	−0.07 (0.17)	−0.23 (0.18)
Total Appearances	0.01** (0.00)	0.02 [†] (0.01)	0.01* (0.00)
Coappearances with Xi		−0.08 (0.07)	
Latent Distance from Xi			−0.80** (0.28)
<i>N</i>	111	111	111
<i>log L</i>	−155.99	−152.28	−149.79

Standard errors in parentheses

[†] significant at $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

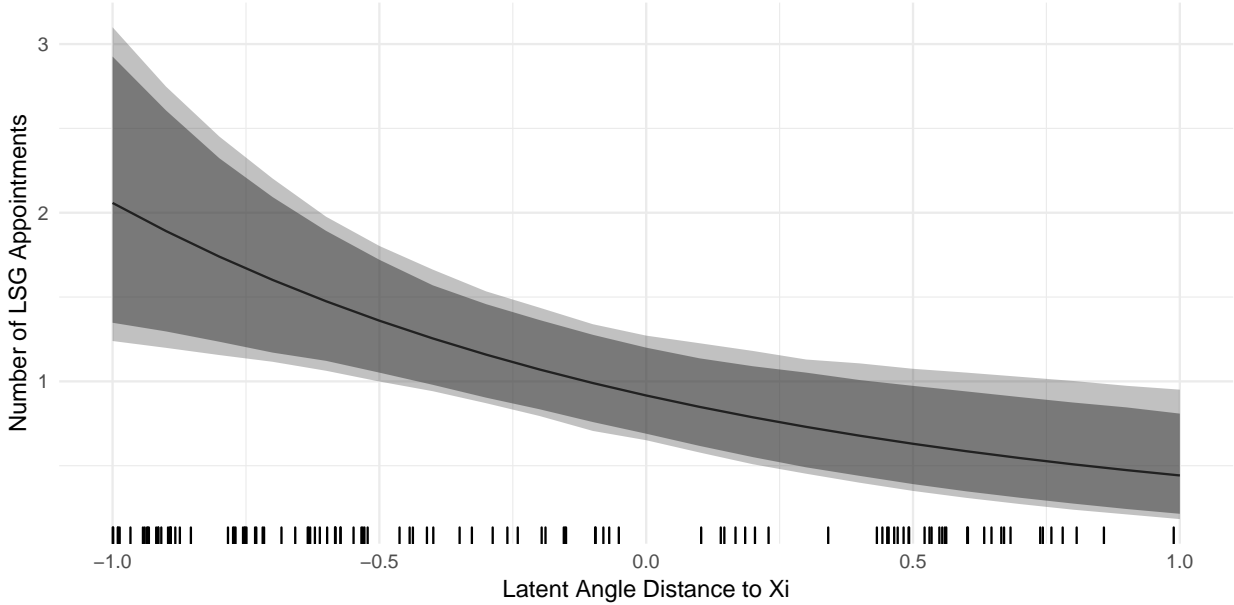


Figure 7: Estimated effect on number of small group appointments based on Latent Distance to Xi.

The results of the three models are reported in Figure 6. 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 — elites who are further from Xi in the latent space are seated on more Leading Small Groups. 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. We also see that when we take into account latent proximity to Xi Jinping, the first order characteristics cease to matter, whereas they have the predicted positive effects (elites that make more appearances also sit on more LSGs) in the other models.

Table 3: Out-of-sample performance on scoring rule metrics for models shown in Table 2. For each of these metrics lower values indicate better performance. For more detail on how each of these scoring rules are calculated see the Appendix.

	Logarithmic	Brier	Spherical	Dawid-Sebastiani	RMSE
Total Appearance	1.77	-0.36	-0.64	2.70	1.89
Total Appearance and Coappearance	1.77	-0.38	-0.66	2.65	1.84
Total Appearance and Latent Distance to Xi	1.73	-0.46	-0.86	2.66	1.74

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 behavior 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. As you can see in Table 2, 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.

Additionally, we attempt to look at models based on distance, not to Xi Jinping, but to Li Keqiang, 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 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 out of sample. This implies that, for elites where their distance 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.

Table 4: Negative binomial regressions on appointment to leading small groups by relationship to Xi and Li.

	Xi Only	Li Only
(Intercept)	−0.23 (0.18)	−0.59** (0.21)
Total Appearances	0.01* (0.00)	0.01** (0.00)
Latent Distance from Xi	−0.80** (0.28)	
Latent Distance from Li		−1.42*** (0.37)
N	111	111
$\log L$	−149.79	−145.65
Standard errors in parentheses		
† significant at $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$		

Table 5: Out-of-sample performance on scoring rule metrics for models shown in Table 4. For each of these metrics lower values indicate better performance. For more detail on how each of these scoring rules are calculated see the Appendix.

	Logarithmic	Brier	Spherical	Dawid-Sebastiani	RMSE
Total Appearance and Latent Distance to Xi	1.73	-0.46	-0.86	2.66	1.74
Total Appearance and Latent Distance to Li	1.64	-0.51	-0.96	2.41	1.90

[max and i thought that the separate analysis by lsg should come after the additional analysis with li][Agree. Yet, probably not an independent section][btw, I need to update bprobit analysis here, right? The numbers are same to my original analysis based on earlier latent distance scores.]

Central Committee vs State Council

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 LSGs. As might be predicted by the institutional setup, latent distance from Xi has a consistent and negative effect on the likelihood of appointment to the Central LSGs, but there is no clear effect on the likelihood of appointment to State LSGs. Conversely, distance from Li Keqiang is associated with a lowered likelihood of appointment to the state LSGs, but not the central ones. The ability to distinguish between promotion to these two types of committees gives us more confidence in the accuracy of our measure at reproducing the latent friendships in the Chinese Communist Party.

Conclusion and discussion

[if we go ahead with including an entire section on central vs state we should make sure to mention this in the conclusion]

Under Xi Jinping, Chinese politics 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. In this study, we propose a latent network approach to explore the dynamic interactions of the CCP elites. 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 on a unique dataset, 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

Table 6: Bivariate Probit Analyses: LSGs of the Central Committee and the State Council

	Latent Distance to Li	Latent Distance to Xi	
		CC	SG
	CC	SG	
Total appearances		0.049***	0.000
0.063***		−0.002	
		(0.017)	(0.003)
(0.017)		(0.003)	
Latent Distance to Xi		−0.621**	−0.261
		(0.286)	(0.230)
Latent distance to Li			
−0.336		−1.857***	
(0.361)		(0.400)	
Intercept 1		−1.195***	
	−1.194***	(0.194)	
	(0.208)		
Intercept 2		−0.698***	
	−1.341***	(0.146)	
	(0.229)		
Intercept 3		0.929**	
	0.910**	(0.409)	
	(0.440)		

Note:

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

examining elites' total appearances, dyadic coappearances, and finally their latent network distance. We find that latent 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 in charge) and dyadic relationships (who do I work with).'

As an important demonstration of this measure's efficacy, we find that our latent measure of affinity helps us to understand important differences between central and state authority in Xi's China. While proximity to Xi helps to explain policy prominence in the central government, it fails to explain membership in state committees. This is better explained by proximity to Li Keqiang. Effectively distinguishing between these two routes to policy influence is a more difficult test of our measure's ability to understand Chinese politics, and one that it passes.

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 autocracies, such as North Korea or the Kingdom of Saudi Arabia.

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