Complementary Roles of Connections and Performance in Political Selection in China *

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Abstract

Who becomes a top politician in China? We focus on provincial leaders, a pool of candidates for top political office, and examine how their chance of being promoted depends on performance – measured by provincial economic growth – and connections with top politicians – measured by past joint work in the same branch of government. A simple theoretical framework suggests that performance and connections may interact, an aspect ignored in the previous literature. Over the period 1993–2009, we find a positive correlation between promotion and growth that is robustly stronger for connected provincial leaders than for unconnected ones. This evidence indicates that performance and connections are complements in the Chinese political selection process. Auxiliary evidence suggests that the documented promotion pattern does not distort the allocation of talent.

1   Introduction

Who becomes a top politician in China? The spectacular economic performance of the Chinese economy in the past few decades suggests that the politicians selected to rule the country may have been conducive to growth, or at least not detrimental to economic development. However, the existing literature on political selection largely remains quiet about what determines the selection of politicians in a non-democratic country like China.[1] In this paper, we attempt to fill this gap in the literature by examining what determines the promotion of provincial leaders in China, a pool of candidates for top posts in the central government.[2] In particular, we focus on two determinants of promotion often discussed by academics and observers of Chinese politics: performance and connections.

Since China is ruled by the Communist Party, the political selection process is equivalent to the promotion of party officials. On the one hand, several empirical studies show that party officials in local governments are more likely to be promoted to higher levels of government if they achieve higher economic growth.[3] On the other hand, anecdotal evidence and a more systematic empirical analysis by Shih et al. (2012) suggest that social connections to top leaders determine the chance of promotion.[4] These two views also appear prominently in the mass media coverage of Chinese politics.[5] We argue that considering either or both of these two aspects in isolation fails to take into account the possibility of important interaction effects between connections and performance in the promotion process. To check this possibility, we conduct an empirical analysis of whether connections and performance

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[1]Most studies in the literature on political selection focus on democracy. See Caselli and Morelli (2004), Messner and Polborn (2004), Besley (2005), Mattozzi and Merlo (2008, 2011), Ferraz and Finan (2011), Galasso and Nannicini (2011), and Besley et al. (2012) among others. Acemoglu et al. (2010) and Besley and Reynal-Querol (2011) compare democracies and non-democracies in terms of political selection. Egorov and Sonin (2011) focus on the dictator's trade-off between choosing competent and loyal politicians as his subordinates. Garcia-Jimeno and Robinson (2011) provide empirical evidence on the type of politicians appointed to mayorship in 19th century Colombia. Francois et al. (2012) analyze how African dictators allocate cabinet minister positions across different ethnic groups.

[2]For example, the three most recent General Secretaries of the Chinese Communist Party (the highest ranked politician in China) all used to be provincial leaders: Shanghai (one of the four municipalities with provincial status) for Jiang Zemin, Guizhou and Tibet for Hu Jintao, and Zhejiang and Fujian for Xi Jinping.

[3]Bo (1996, 2002), Maskin et al. (2000), Li and Zhou (2005) and Chen et al. (2005) provide evidence for provincial leaders, Whiting (2000) and Edin (2003) for township leaders, and Landry (2008) for mayors. Huang (1998) appears to be the first to argue that the Chinese central government uses performance-based promotion to overcome the difficulty in controlling local government officials. Blanchard and Shleifer (2001) apply this argument to explain economic growth in China. Li (2012) provides evidence that the performance-based promotion scheme for provincial leaders drives business cycles in China. See also Xu (2011) for a thorough survey of this literature.

[4]Jiang Zemin, General Secretary from 1989 to 2002, is well-known for having promoted his former colleagues when he was the leader of Shanghai (those promoted are thus known as the Shanghai clique). Hu Jintao, who succeeded Jiang in 2002, is also widely known for having promoted his former colleagues while being the leader of the Communist Youth League, a youth organization of the Chinese Communist Party (such promoted officials are known as *tuanpai*).

[5]For example, in the lead-up of the 18th National Congress of the Communist Party held in November 2012, where many promotion decisions would be made, the *New York Times* published articles emphasizing both aspects: Zhang (2012) for the performance view and Wong (2012) for the connection view.

are complements or substitutes as the determinants of promotion for provincial leaders.

As the interdependent roles of connections and performance in the promotion decision have never been discussed in the previous literature, we first present a simple model of promotion to illustrate why connections and performance may jointly affect the chance of promotion. In this model, promotion acts as a screening device.[6] Connections play either a loyalty-fostering role (increasing the top politicians' probability of survival) or an informational role (conveying information on the ability of candidates for promotion). When the loyalty-fostering role of connections dominates, connections and performance complement each other to increase the chance of promotion. If the informational role dominates, on the other hand, the two determinants of promotion are substitutes.

To investigate whether the correlation between promotion and performance is stronger or weaker for connected officials as compared to unconnected ones, we construct a sample of Chinese provincial leaders in office between 1993 and 2009. Using the curriculum vitae of Communist Party officials, we measure connections between these provincial leaders and the top seven or nine party officials at the center by whether they used to work in the same branch of the party or the government in the same period.[7] To measure performance, we follow the literature and use the real GDP growth of the province that each leader rules.

Neither connections nor growth are exogenous, even if we control for province and year fixed effects. Therefore, we do not claim that our analysis establishes causal effects of connections and performance on promotion. Our aim is instead to present a robust empirical pattern that has previously been ignored in the literature, namely, the correlation between promotion and the *interaction* of connections with performance.[8]

We find that connected provincial leaders are, on average, significantly more likely to be promoted than unconnected ones. However, this difference is driven by a stronger positive correlation between promotion and economic growth for connected officials. Low-performing provincial leaders are unlikely to be promoted irrespective of their connections, while connections increase the likelihood of promotion for high-performing provincial leaders. In other words, connections and performance are indeed complements in the promotion of provincial leaders in China. In light of our theoretical framework, this evidence is consistent with the prediction that connections mainly play a role in fostering the loyalty of subordinates to top politicians. Moreover, we find that the complementarity is stronger for the connected pairs in which provincial leaders are substantially younger than the PSC members. Since Communist Party officials compete for high office with similar-aged peers, but not with senior peers,

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[6]In Appendix Section A.1, we also present a model of promotion where promotion acts as an incentive scheme for provincial leaders to boost economic growth.

[7]We also measure connections based on education and birth place, but these measures do not have any significant correlations with promotion. See Section 5.4.

[8]For provincial economic growth, exploiting its exogenous variation does not really help us answer the question of whether performance affects promotion. An exogenous shock in economic growth is, by definition, beyond the control of provincial leaders, and its effect on promotion will reflect whether top leaders in China are fooled (see Bertrand and Mullainathan (2001) for such a study in the context of CEO pay), a question that might be of less importance.

this finding provides further evidence in favor of the loyalty-fostering role of connections.

The documented pattern of correlations is remarkably robust to different definitions of promotion and to controlling for a wide range of covariates and their interaction terms with provincial economic growth that may confound the effect of connections. Finally, by looking at a subset of provincial leaders who hold provincial leadership positions more than once (so that we can measure their performance in terms of provincial economic growth after the promotion decision has been made), we find suggestive evidence that the promotion pattern we uncover does not distort the allocation of talent within the Communist Party.

In addition to the studies that have already been mentioned, this paper is also related to an emerging literature on the impact of social connections to policy-makers (Fisman 2001, Khwaja and Mian 2005, and Blanes i Vidal et al. 2011, among others). While these studies benefit from more convincing causal inference than our study, they do not look at the impact on political outcomes as we do.

In the context of China, Persson and Zhuravskaya (2012) find that provincial leaders who rule their native province invest less in infrastructure and spend more on education and health than those not born in the province they rule. They interpret this finding as the effect of stronger social connections between native provincial leaders and other provincial political elites. The focus of our paper, on the other hand, is on provincial leaders' connections to top leaders in the center. Shih (2004, 2008) gauges social connections of provincial leaders in a similar way to ours, but investigates the impact of connections on the loan-to-deposit ratio of each province, interpreted as the support from the central government (as major banks are under the control of the central government). We focus on the impact of connections on political outcomes instead of policy outcomes.

The next section briefly introduces relevant aspects of the Chinese political system. Section 3 then lays out a simple theoretical framework describing how connections and performance may interact with each other to affect the probability of promotion. Section 4 describes the data and the empirical strategy. Section 5 reports the empirical results and various robustness checks. Section 6 discusses our results and provides suggestive evidence on potential distortions in the allocation of talent. Section 7 concludes the paper.

2 Institutional Background

China's highest decision-making body is the Politburo Standing Committee (PSC) of the Communist Party of China. It consists of seven (or nine during 2002–2012) party officials including the General Secretary (the head of the Communist Party) and the Premier (the head of the Chinese government). Although the procedure of its decision-making is not public information, it is commonly believed that members of the PSC meet once a week and make decisions by consensus (Shirk 1993, Miller 2004, McGregor 2010). Among other things, the committee decides on which provincial leaders to promote.

Each of the 31 provinces of China (including four municipalities with provincial status

and five autonomous regions) has two political leaders: provincial secretary and provincial governor. The former is the head of the provincial branch of the Communist Party, and the latter is the head of the provincial government. Provincial secretaries are ranked equally to ministers in the central government, and ranked higher than provincial governors. By "provincial leaders", we mean these two political leaders in each province.

Provincial leaders in China have a large discretion over economic policies at the provincial level while their career prospects are controlled by the central government.[9] Provincial economic performance, specifically real GDP growth, is considered to be a performance measure highly relevant to the PSC's promotion decision (Maskin, Qian, and Xu 2000; Blancher and Shleifer 2001).

Promoted provincial leaders may join the Politburo of the Communist Party (the second most powerful decision-making body after the PSC) and/or become Vice-premier or State Councilor, the highest positions in the central government after the Premier. In other words, promoted provincial leaders become close colleagues of the PSC members. Promoting political enemies may thus threaten the power of the PSC members.

In the next section, we present a simple model that incorporates these institutional aspects of Chinese politics.

3   A Simple Model

Since the previous literature ignores the interplay of connections and performance in the promotion decision for Chinese provincial leaders, we propose a theoretical framework to demonstrate how such interplay may emerge. In this framework, the PSC acts as a unitary player. Social connections to a PSC member play either of two roles in promotion. First, connections foster loyalty of provincial leaders to PSC members, implying that the probability of the PSC to survive in office is higher if the PSC promotes a connected provincial leader. Second, connections provide PSC members with information on the ability of provincial leaders. We argue that the loyalty-fostering role of connections implies complementarity between connections and performance while the informational role implies substitutability.

Of course, other mechanisms may explain complementarity or substitutability of connections and performance. In the Appendix (Section A.1), we model promotion as an incentive scheme for provincial leaders to boost growth. That model predicts the interdependence of connections and performance as long as the PSC can commit to the promotion scheme, which may be a strong assumption. Bargaining among PSC members with conflicting interests may also yield complementarity or substitutability of connections and performance. However, we know very little about the actual bargaining process of the PSC. In addition, during the sample period of our data (1993–2009), the membership composition of the PSC

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[9]Xu (2011) refers to this institutional feature as a *regionally decentralized authoritarian system*. Although it is interesting to study the coordination and competition between secretaries and governors, we leave this to future research.

only changed three times, not enough to test the implications of a bargaining model.

Although we do not claim that the framework in this section accurately portrays the mechanism at work for the promotion of Chinese provincial leaders, we think it is the simplest one to illustrate the interdependent roles of connections and performance.

3.1   Model

Consider a simplified version of the standard career-concern model (Holmström 1982), where the PSC is the only strategic player and unitarily decides whether or not to promote a provincial leader i. Provincial leaders are assumed to be non-strategic: they simply produce provincial economic growth out of their talent. As we show in the Appendix (Section A.2), the theoretical results are mostly robust to a strategic provincial leader whose effort affects provincial growth as in the standard career-concern model.

The unitary PSC derives its utility from the rent obtained by being in office and the ability of the promoted provincial leader i, denoted by R and a_i, respectively. For simplicity, we assume the following functional form:

$$u(R, a_i) = R + \eta a_i$$

where parameter η measures the extent to which the PSC prefers promoting an official with higher ability (i.e. meritocracy).

Ability, a_i, is assumed to be unobservable to the PSC. However, provincial economic growth since i starts ruling the province, denoted by g_i, is observed and determined by:

$$g_i = a_i + \varepsilon_i, \tag{1}$$

where ε_i is normally distributed with mean zero and variance σ_ε.

We now introduce connections into this framework. Let $C_i \in \{0, 1\}$ be an indicator that takes the value of one if i is connected to the PSC and zero otherwise. The loyalty-fostering role of connections is represented by assuming that the probability for the PSC of staying in power depends on C_i, where this probability, denoted by $p(C_i)$, satisfies $p(1) > p(0)$. Unconnected, and thus disloyal, officials are more likely than connected ones to attempt to oust other PSC members, if they are promoted.

The informational role of connections is modeled as follows. The provincial leader's ability, a_i, is unobservable to the PSC but known to be normally distributed with mean $\bar{a}$ and variance $\sigma_a(C_i)$. If connections inform the PSC of the ability of provincial leaders, the precision is higher: $\sigma_a(1) < \sigma_a(0)$.[10]

The expected utility of PSC from promoting i with connection status C_i and growth

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[10]As discussed below, allowing connections to affect the mean ability does not change the nature of the interaction between connections and performance in determining the promotion probability.

performance g_i, which we denote by $W_i^{C_i}$, is then written as follows:

$$W_i^{C_i} \equiv E[u(R, a_i)|g_i] = p(C_i)[R + \eta E(a_i|g_i)], \tag{2}$$

where we normalize the payoff of being ousted from office to zero.

If the PSC does not promote i, its payoff is given by $\bar{u}$, which may represent the payoff of promoting the most able official in the central government or leaving the high-office position vacant. Provincial leader i is promoted if $W_i^{C_i} \geq \bar{u}$. Assuming that $\bar{u}$ is distributed by its cumulative density function $F(\bar{u})$, the probability of promotion for i is given by $F(W_i^{C_i})$. For simplicity, we assume that $\bar{u}$ is uniformly distributed with the probability density μ.[11]

3.2 Analysis

From equation (1) and the distributional assumptions on a_i and ε_i, $E(a_i|g_i)$ is given by the weighted average of g_i and $\bar{a}$ with the weights being the relative precision of growth and ability:

$$E(a_i|g_i) = h(C_i)g_i + (1 - h(C_i))\bar{a}, \tag{3}$$

where

$$h(C_i) \equiv \sigma_a(C_i)/(\sigma_a(C_i) + \sigma_\varepsilon).$$

Note that $\sigma_a(1) < \sigma_a(0)$ implies $h(1) < h(0)$. That is, the informational role of connections makes the precision of the prior on i's ability higher.

Hence, the marginal increase in the promotion probability with respect to economic growth g_i is:

$$\frac{\partial F(W_i^{C_i})}{\partial g_i} = \mu \eta p(C_i) h(C_i). \tag{4}$$

If this expression is larger for $C_i = 1$ than for $C_i = 0$, connections and growth complement each other in increasing the promotion probability. If it is smaller for $C_i = 1$, connections and growth are substitutes. If it is the same irrespective of C_i, the effects of connections and growth on promotion are independent of each other.

Inspecting Equation (4) yields the following proposition.

Proposition 1. *The effects of connections and growth on promotion are:*

1. *Independent if*

    (a) $\eta = 0$ or $h(C_i) = 0$ (i.e. $\sigma_\varepsilon = \infty$). In this case, provincial growth does not affect the promotion probability, and the PSC prefers promoting connected officials as

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[11]As shown in Appendix Section A.2, the functional form for $F(\bar{u})$ does not matter in deriving the interdependence of connections and growth in the promotion probability as long as one of the two roles of connections dominates the other. If the two roles of connections are similarly important, whether connections and growth are complementary or substitutes depends on the level of the observed growth rate, g_i.

long as $p(1) > p(0)$.

   (b) $\eta > 0$, $h(C_i) > 0$, but $p(1)h(1) = p(0)h(0)$. In this razors-edge case, the promotion probability increases with growth, but not with connections.

2. *Complementary if $\eta > 0$ and*

$$\frac{p(1)}{p(0)} > \frac{h(0)}{h(1)}. \tag{5}$$

3. *Substitutes if $\eta > 0$ and*

$$\frac{p(1)}{p(0)} < \frac{h(0)}{h(1)}. \tag{6}$$

Proof. Substitution of parameter conditions into expression (4) and comparison between $C_i = 1$ and $C_i = 0$ trivially prove the statements in the proposition. $\qquad\square$

    Proposition 1 shows that the interplay of connections and growth in affecting the promotion probability requires three conditions: (1) the PSC cares about the ability of promoted officials, (2) provincial growth contains a signal on the ability of provincial leaders, and (3) connections play at least one of the two roles specified in this model.[12] The proposition also shows that if the loyalty-fostering role of connections (represented by $p(1)/p(0)$) is relatively larger (smaller) than the informational role of connections ($h(0)/h(1)$), the responsiveness of the promotion probability with respect to growth is higher (lower) for connected provincial leaders.

3.3   Discussion

The Appendix (Section A.2) discusses several extensions of the above model. First of all, the probability of staying in office, $p(C_i)$, may decrease in a_i if competent officials threaten the survival of top leaders.[13] On the other hand, connections may mitigate this threat by fostering loyalty. In this case, the result is robust as long as $p(1)/p(0)$ is sufficiently larger or smaller than $h(0)/h(1)$.

    Second, provincial leader i may be able to boost the economic growth of his province by exerting effort (as in a standard career-concern model). As long as ability and effort affect growth additively, however, such strategic behavior of provincial leaders does not alter our result.

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[12]In the unlikely case in which the loyalty-fostering role of connections exactly cancels the informational role of connections to satisfy $p(1)h(1) = p(0)h(0)$, the interdependency of connections and growth disappears (case 1 (b) in the Proposition).

[13]Egorov and Sonin (2011) argue that the tradeoff between loyalty and ability creates a dilemma for the dictator when choosing high officials. See also Besley et al. (2012) in the context of the choice of electoral lists by political party leaders in Sweden.

Finally, the role of connections in the above model may seem restrictive in several ways. Average ability, $\bar{a}$, for example, may depend on C_i. Connected provincial leaders may have a higher $\bar{a}$ if the PSC can screen out less able candidates for provincial leadership positions among those connected. However, as expression (4) does not contain $\bar{a}$, allowing connections to influence $\bar{a}$ does not change the above result.[14]

The variance of the stochastic shock in the growth process, σ_ε, may also be smaller for connected provincial leaders. Because of their loyalty to the PSC, connected provincial leaders may have a larger incentive, or feel more obliged, to tell the PSC the truth about what has happened to the economy of their province beyond their control. As discussed in the Appendix, this role of connections makes condition (5) more likely to hold, even if $p(1) = p(0)$. We are unable to distinguish this mechanism from the political survival mechanism (i.e. through $p(C_i)$ in the model) in the empirical analysis below.

In summary, the above analysis shows that the effects of connections and growth on promotion can be intertwined, an insight that has been ignored in the previous literature. In the empirical analysis to follow, we investigate whether the promotion probability indeed responds to the interaction of connections and growth.

4   Data and Empirical Strategy

Our main data source is China Vitae (2012), a website run by a non-profit organization in the United States. It publishes curriculum vitae (CV) of Chinese Communist Party officials who have held important positions since late 1992. The CV includes the year of birth, the province of birth, colleges attended, and, most importantly, the list of positions held in the party or in the government (including state-owned enterprises) in the past, along with the period in which each position was held.

We first explain how our sample of provincial leaders is selected and then explain how we use their CV to measure promotion and connections. We also discuss the data on provincial economic growth and present summary statistics. After presenting the data, we explain our main empirical strategy.

4.1   Sample

We focus on provincial secretaries and governors, who hold office for at least twelve months in between June 1993 and June 2009.[15] There are 275 provincial leadership spells (137

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[14]For general distribution functions of $\bar{u}$, the result is robust as long as $p(1)/p(0)$ is sufficiently larger or smaller than $h(0)/h(1)$. See Appendix Section A.2.

[15]We start from 1993 because China Vitae (2012) does not cover officials in office in June 1992 or before. Our sample period ends in 2009 as annual growth data is available up to 2009 when the first draft of this paper was written. We look at June because, following Li and Zhou (2005), we measure the promotion outcome during the period between July of year t and June of year $t + 1$, which is to be matched with economic growth in year t. Finally, we drop provincial leaders whose tenure is less than twelve months because the promotion of such leaders is unlikely to be associated with annual provincial growth.

secretaries and 138 governors) that satisfy these criteria. From this set of spells, we drop 17 (seven secretaries and ten governors) whose CV is not available in China Vitae (2012).[16] Since some officials assume a provincial leadership position more than once, the total number of officials in the sample is 187, i.e. less than the 258 observed leadership spells.

4.2 Promotion

Following Li and Zhou (2005), we define the promotion of a provincial secretary as becoming a member of the Politburo (the second highest decision-making body in the Communist Party, consisting of 20 to 25 members that include all members of the PSC), a Vice-Premier or a State Councilor in the central government.[17] A provincial governor is promoted if he becomes a secretary of the same or a different province. There is no instance where a provincial governor joins the Politburo or becomes a Vice-Premier or a State Councilor, suggesting that the two sets of provincial leaders compete for separate higher offices.

Assuming other positions in the central government such as vice-chairmanship of the Chinese parliaments (National People's Congress and Chinese People's Political Consultative Conference) and, for governors, the head of a ministry could perhaps also be seen as promotion (see Tao et al. 2010). We investigate the robustness of our results to these wider definitions of promotion.

4.3 Connections

We measure the connection between a pair of party officials by whether they used to work in the same branch of the Party or of the government at the same time. In particular, we focus on links between each provincial leader and any current member of the PSC, given that the PSC is in charge of the decisions on the promotion of provincial leaders.[18] The connection indicator can thus change for the same provincial leader if his connected PSC member resigns or if his connected official joins the PSC.[19] In our sample period, we find that connections between PSC members and provincial leaders are mostly formed at the

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[16]There is little attrition bias in terms of provincial economic growth: the difference in the average annual provincial growth since assuming office is 0.7 percentage points (not statistically different from zero), 6% of the whole sample mean, between provincial leaders with and without an available CV, conditional on province and year fixed effects.

[17]Some provincial secretaries join the Politburo without leaving office. If this happens, we again follow Li and Zhou (2005) by recording this as their promotion and treating the rest of the leadership spell as a separate one. There are three such cases. When a provincial secretary with the Politburo membership leaves office, joining the PSC is defined as promotion.

[18]We also consider links between each provincial leader and any current members of the Politburo, to see if connections to the PSC may pick up the effect of being connected to the political elite more generally.

[19]Potentially we can exploit this within-individual variation to identify the impact of connections, as in Jia (2012), because membership changes in the PSC are plausibly exogenous. Out of 187 officials in the data, however, only 25 change their connection status during their tenure. When we estimate the stratified Cox proportional hazard model where the stratum is each individual (so we can control for unobserved heterogeneity across individuals), we obtain results with very large standard errors.

provincial branches of the Party and of the government, but also at central bodies such as ministries, the National People's Congress and the Communist Youth League.[20]

The focus on workplace-based connections among Chinese politicians is motivated by the anecdotes mentioned in footnote 4: Jiang Zemin and Hu Jintao promoted their former colleagues in Shanghai and the Communist Youth League, respectively, once they became General Secretary. However, the literature on informal politics in China (see Dittmer 1995, for example) also points out the importance of other sources of connections among politicians, such as graduating from the same college or hailing from the same province. We investigate whether these alternative sources of connections are also of importance.

An estimation of the effect of connections defined in this way should be seen as an "intention-to-treat" analysis, using the language of the program-evaluation literature. Having worked together in the past does not necessarily mean being loyal to each other or being well informed about each other's ability. However, it is plausible that having worked together increases the probability of being loyal to and/or familiar with each other. As a result, if we do not find connections significantly correlated with promotion, we should not interpret this to say that connections are unimportant.

4.4   Economic Growth

The data on provincial annual real GDP growth up to year 2009 is obtained from the National Bureau of Statistics of China (2009, 2011).

One may question the reliability of the provincial GDP growth data, given the possibility that higher growth increases the chance of promotion for top provincial politicians. The central government of China ensures the reliability of provincial GDP data in two ways.[21] First, each provincial government is required to submit the figures for various subcomponents of GDP. The National Bureau of Statistics (NBS) in the central government then double-checks the total GDP figure by aggregating these subcomponents on its own. Second, the NBS conducts its own survey to obtain its own estimates of provincial GDP. Therefore, even though provincial leaders may have an incentive to overreport the growth of their provincial economy, the provincial GDP data should reflect the actual performance of the economy to a large extent.[22]

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[20]We also find that the difference in position ranks for connected pairs (each position of the Party and the government has an official rank) is usually no more than two when they worked together.

[21]We thank Li-An Zhou for providing us with this information.

[22]We corroborate the quality of the provincial growth data by checking if it reflects the growth in nighttime lights observed by satellites. Nighttime lights can be seen as an objective measure of living standards, and therefore its correlation with GDP is indicative of the quality of GDP data. Using data on nighttime lights from National Geophysical Data Center (2010) and on Chinese provincial boundaries form Natural Earth (2012), we follow Henderson et al. (2012) in measuring and aggregating nighttime lights to the provincial level. The correlation coefficient (conditional on province and year fixed effects) between annual GDP growth and annual light growth is about 0.1, significantly different from zero at the 5% level. This evidence suggests that real GDP growth, at least to some extent, reflects improvements in some dimensions of living standards captured by nighttime lights.

4.5   Summary Statistics

Column 1 of Table 1 reports summary statistics for the variables used in the following analysis at the level of 258 leadership spells. Columns 2 and 3 restrict the sample to provincial secretaries and governors, respectively. About a quarter of the provincial leadership spells end with promotion. The promotion rate is lower for secretaries, consistent with the fact that secretaries are more highly ranked than governors in the Communist Party hierarchy. The share of spells with the provincial leader connected to PSC members for at least one year is about a quarter, with a slightly higher share for secretaries. The mean of average annual provincial real GDP growth since assuming office is around eleven percentage points. Each leadership spell lasts 4.3 years on average, consistent with the fact that the Communist Party makes major personnel decisions every five years when the Party Congress is held.

In the empirical analysis below, we construct a leader-year level sample in which each leadership spell is observed annually until the leader is transferred to another position, irrespective of whether it is a promotion or not. This process results in 966 observations. The summary statistics for this sample is reported in column 4 of Table 1.

Figure 1 shows the rate of promotion (the line graph) and the distribution of tenure length (the bar graph) by the number of years in office. It shows that the chance of promotion increases until the fifth year in office and declines thereafter. The peak at five years is expected, since many of the personnel decisions are made at the National Congress of the Communist Party which is held every five years. The figure also shows that the majority of leadership spells ends in five years or less.

4.6   Empirical Strategy

The structure of the leader-year level data suggests using a competing risks model, in which observations exit from the data through more than one type of event (promotion and non-promotional transfer in our case). However, below we treat non-promotional transfers as right-censoring by assuming that non-promotional transfers occurs randomly. Furthermore, we use a linear probability model of promotion, instead of a Cox proportional hazard model, by assuming that the duration of each leadership spell does not depend on connection status and growth. Although these assumptions are restrictive, the linear probability model allows us to control for unobservable heterogeneity across provinces and years that can differ between secretaries and governors, which we believe is important in our context to minimize the bias in the estimation.

Therefore, to investigate how the promotion of provincial leaders is correlated with their connections and performance, we estimate the following linear probability model:

$$P_{iopt} = \alpha C_{it} + \beta(G_{iopt} - \bar{G}) + \gamma C_{it} * (G_{iopt} - \bar{G})$$

$$+ \boldsymbol{x}'_{iopt}\boldsymbol{\delta} + (G_{iopt} - \bar{G}) * \boldsymbol{x}'_{iopt}\boldsymbol{\xi} + \sum_{\tau=2}^{12} \kappa_\tau T^\tau_{iopt} + \mu_{op} + \eta_{ot} + \varepsilon_{iopt} \qquad (7)$$

The dependent variable, P_{iopt}, is the indicator that takes the value of one if provincial leader i in office o (secretary or governor) in province p is promoted in the period from July of year t to June of year $t + 1$.[23] We have three regressors of interest. The first is C_{it}, the indicator of leader i being connected to the members of the PSC in office in June of year t. The second is G_{iopt}, the average annual growth rate of province p since leader i assumed office o until year t, measured as the deviation from the sample mean, $\bar{G}$ (11.4%). The last is the interaction term of these two variables. To facilitate the interpretation of the coefficient on the connection indicator, β, the growth variable is demeaned so that β measures the difference in the probability of promotion between connected and unconnected officials displaying average growth performance. For robustness checks, we control for $\boldsymbol{x}_{iopt}$, a vector of characteristics of provincial leader i and province p in year t, and its interaction with $(G_{iopt} - \bar{G})$, to investigate whether the endogeneity of C_{it} is driving our main results.

Province and year fixed effects are allowed to differ between secretaries and governors (μ_{op} and η_{ot}). Controlling for province fixed effects ensures that the coefficients of interest (α, β, γ) do not pick up the possibilities that certain provinces which grow more quickly also have their leaders more likely promoted and connected. Controlling for year fixed effects incorporates the possibility of relative performance evaluation, often discussed in the literature on Chinese political selection (e.g. Maskin et al. 2000, Chen et al. 2005). It also allows for higher promotion rates in Party Congress years, in which many personnel decisions are made.

Since the promotion probability changes non-linearly with the number of years in office, as suggested by Figure 1, we also control for a set of dummies for the number of years in office from two to twelve (T^{τ}_{iopt}).[24] Standard errors are clustered at the province level given that both growth rates, G_{iopt} and the error term are likely to be serially correlated within each province, and C_{it} tends to take the same value for the same province for a certain number of years. As the low number of Chinese provinces (31) may cause an underestimation of the standard errors, even with clustering, we also report p-values on the significance of the estimated γ by using the wild cluster bootstrap-t procedure (Cameron et al. 2008).

The coefficient on the interaction term of connections and growth, γ, is negative if the two determinants of promotion are substitutes and is positive if they are complements.

5   Empirical Results

We present our empirical results in three steps. First, we show our baseline estimates. Second, we discuss the endogeneity concerns of connections and growth. Third, we present various robustness checks and additional results.

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[23]See footnote 15 for why we measure promotion during the period from July.

[24]These dummies may be endogenous. However, the results do not differ significantly if we do not control for these dummies.

5.1 Baseline Estimates

Table 2 shows our main results from estimating equation (7) by adding regressors of interest one by one without controlling for any covariates ($\boldsymbol{x}_{iopt}$). The first three columns estimate the correlations of promotion with connections and growth without introducing their interaction term, thus making them directly comparable to previous studies. Column 1 shows that connected provincial leaders are more likely to be promoted. The difference is estimated at 4.9 percentage points – nearly 60% of the average promotion rate – and statistically significant at the 5% level. This finding confirms anecdotal pieces of evidence mentioned in the introduction. It is also in line with recent evidence by political scientists (Shih et al. 2012). In column 2, we find that the promotion probability increases with the provincial economic growth during the tenure, although it is not significantly different from zero. The point estimate suggests that one standard deviation increase in growth (by 2.4 percentage points) pushes up the probability of promotion by 1.7 percentage points. This magnitude is comparable to the one estimated by economists (Li and Zhou 2005).[25] Column 3 includes both the connection indicator and provincial GDP growth as regressors. The results are similar to those in the previous columns, suggesting that the connection status is largely orthogonal to provincial GDP growth once province and year fixed effects are controlled for.

Column 4 presents our key finding by including the interaction term of connections and growth as a regressor. The coefficient on the interaction term is positive and statistically significant at the 5% level (or at the 10% level if we use the p-value by Cameron et al. (2008)), suggesting that the two determinants of promotion are complements rather than substitutes. The point estimate indicates that a one standard deviation increase in growth raises the promotion probability by 5.3 percentage points more for connected officials than for unconnected ones. The coefficient on the connection indicator suggests that the promotion rate for provincial leaders with the sample average growth is 3.2 percentage points higher for those connected than for those unconnected, although this difference is not statistically significant. The growth effect for unconnected officials is insignificant although the point estimate suggests that a one standard deviation increase in growth increases the probability of promotion by 0.8 percentage points, which is more than 10% of the sample mean promotion rate.

Figure 2 shows this main result graphically. We first regress both the promotion dummy and provincial growth since assuming office on dummies of the numbers of years in office, province-office fixed effects, and year-office fixed effects, and obtain the residuals from these regressions. Then, we divide the observations into tertiles according to the residual growth, irrespective of connection status. Finally, for each tertile, we plot the average residual promotion rate by connection status. We also use the bar graph in the background to show

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[25]The result of Li and Zhou (2005) suggests that a one standard deviation increase in growth raises the promotion probability by 1.8 percentage points and is statistically significant from zero at the 1% level. The main differences to our estimates are that: their sample spans the period from 1979 to 2002, and they do not cluster standard errors at the province level.

the distribution of connected observations across growth tertiles.

The figure shows that the complementary result is entirely driven by a large difference in the promotion rates between connected and unconnected provincial leaders among the top-third of growth performers. For unconnected provincial leaders, the worst third performers are slightly less likely to be promoted than the rest. In terms of the distribution of growth performances, connected officials are most likely to be in the middle tertile, but do not disproportionately perform better or worse than their unconnected peers. We discuss possible interpretations of this graphical result in Section 6.1 below.

Our key finding implies that the previous literature fails to recognize the importance of the interplay between connections and growth in determining the promotion of provincial leaders, and perhaps of Chinese Communist Party officials in general. Connected officials do have a higher likelihood of promotion on average, but this is solely due to their promotion probability being more responsive to performance. Put differently, officials with a better performance appear to be promoted more often, but this relationship mainly applies to those connected to top political leaders of China.

In terms of the theoretical framework introduced in Section 3, our results suggest that connections have more to do with fostering loyalty of provincial leaders to top leaders than with information about their ability.

5.2   Endogeneity of Connections and Growth

Endogeneity of Connections   The connection status of provincial leaders may certainly be endogenous to their promotion probability. Table 3 compares the means of observable characteristics of provincial leadership spells between those connected and those unconnected, where the connection status is measured at the first year of the spell (as changes in the connection status during the tenure are due to the membership shuffling of the PSC and thus more likely to be exogenous). Connected leadership spells end with promotion 9 percentage points more often than unconnected ones. The average annual growth at the end of the spell is significantly higher for connected leaders. The length of tenure is slightly shorter for the connected.

In terms of individual characteristics, connected officials are significantly younger and more likely to have served in the central government. In terms of provincial characteristics, the provinces ruled by connected officials are more likely to have higher economic growth in the five-year period before the officials assume office, less likely to be the home province for provincial leaders, and more likely to be the one in which the current members of the PSC used to work.

However, many of these differences can be explained by differences in provinces and time periods when connected and unconnected leaders are in office. Column (4) reports the estimated coefficient on the connection indicator from regressing each of these variables on the connection indicator, office-by-province fixed effects, and office-by-year (where the year refers to the one when each leader assumes office, ranging from 1983 to 2009) fixed

effects. Except for the age when assuming office, the indicator of having served in the central government, and whether the current PSC members used to work in the province, the connection coefficient is not significantly different from zero. In Section 5.3 below, we control for the aforementioned variables to check whether the connection status picks up the effect of observable differences between connected and unconnected provincial leaders.

However, these observable characteristics may not reflect how much support provincial leaders obtain from the central government due to their connection to the PSC members. PSC members may help connected provincial leaders achieve high growth so that they can promote them as if the decision were based on meritocracy. We do not observe all dimensions of the support by the central government to each province, but we do have the data on fiscal transfers from the center to each provincial government annually since 1994 (China Financial & Economic Publishing House, various years). The last row in Table 2 reports the difference in average annual fiscal transfers during the term between connected and unconnected provincial leaders. An unconditional comparison suggests that connected provincial leaders do obtain significantly more fiscal transfers from the central government. But, once we take into account province and year fixed effects, this difference is no longer significantly different from zero.

Endogeneity of Growth   The provincial GDP growth data may not reflect the performance on basis of which the promotion decision is taken. For example, provincial growth may be higher for those who are promised promotion, because the central government offers support to them to boost the economic growth of their province so that their promotion will look merit-based. If so, we should see a significant drop in economic growth in the province after its leader has been promoted. Columns 1 and 2 of Table 4 investigate this issue. With balanced panel data of provinces for 1993-2009, we regress annual real GDP growth on indicators for one, two, and three years after promotion as well as on province and year fixed effects. These indicators are defined based on the promotion of provincial secretaries in column (1) and governors in column (2). The estimated coefficients on these indicators are, however, insignificant and positive in most cases.

Provincial growth may also reflect the strength of connections. Our measure of connections does not necessarily reflect the actual connections. PSC members may provide support to boost the economy only to those provincial leaders who are actually connected to them. Although we cannot entirely dismiss this possibility, we can use observable characteristics of connections that may be correlated with the strength of connections, to check if real GDP growth is higher for provinces whose leader's connection to the PSC is stronger. Columns (3) to (6) of Table 4 run provincial panel regressions of the following form:

$$g_{pt} = \phi C_{pt} + \xi C_{pt} * Z_{pt} + \psi_p + \omega_t + \varepsilon_{pt},$$

where g_{pt} is the annual real GDP growth of province p in year t, C_{pt} the indicator that the leader in province p in year t is connected to the PSC member(s), Z_{pt} the strength of

connections of the leader in province p in year t, ψ_p the province fixed effect, and ω_t the year fixed effects. We use two variables to measure Z_{pt}. First, we measure the number of years that the provincial leader has worked together with his connected PSC member(s), assuming that a longer time together strengthens connections.[26] Second, we take the difference in ages between the connected pair by subtracting the age of the PSC member from the provincial leader, assuming that a larger age difference strengthens connections. Different generations of party officials do not compete with each other for power due to the seniority system of promotion.[27] We run this regression separately for provincial secretaries and provincial governors, the former reported in columns (3)-(4) and the latter in (5)-(6).

Columns (3) and (5) measure the strength of connections by the number of years working together. While this interaction term is insignificant for provincial secretaries, growth is significantly higher for provincial governors whose connection is stronger by this measure. Plotting the data, however, reveals that this result is driven by one observation (Fujian in 1993) where the governor has worked with a PSC member for 14 years (the maximum in the sample) and the provincial economy grew by 22.6%, almost twice the sample mean. If we drop this observation, however, there is no substantial change in our main results.[28]

Columns (4) and (6) use the age difference variable (which is positive if the provincial leader is older than his connected PSC members) as a measure of the strength of connections. Its interaction term with the connection indicator is insignificant both for provincial secretaries and governors.[29]

These results suggest that provincial growth is not higher for those provincial leaders whose connections may be stronger in terms of observable dimensions, encouraging the interpretation of growth as a performance measure, rather than a measure of the strength of connections.

5.3   Robustness Checks

Definitions of Promotion   The first set of robustness checks on our key finding concerns the definition of promotion. Tao et al. (2010) suggest that the definition of promotion of provincial leaders should include three additional appointments. Thus, we broaden the definition of promotion step by step in the final three columns in Table 2. Column 5 changes the definition of promotion so that becoming a minister is also regarded as promotion for provincial governors. Ministers are officially ranked equal to provincial secretaries. As governors

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[26]If the provincial leader has more than one connection, we take the average. The results do not substantially change if we take the maximum or the minimum.

[27]It might also be the case that the connections are stronger if the connected pair of individuals is more similar in age. To reflect this possibility, we also measure the age difference in absolute value. The results are similar.

[28]The coefficient on the interaction of connection and growth for column (4) of Table 2 is reduced by one-fifth in size, but it remains significant at the 5% level.

[29]Since the age difference is correlated with the provincial leader's own age, we also run regressions where we control for the age and its interaction with the connection indicator. The coefficients on the age difference interacted with the connection indicator remain insignificant.

are ranked below secretaries in each province, becoming ministers can be seen as promotion for governors. Seven additional leadership spells end with promotion in this definition.

Column 6 further changes the definition of promotion, including appointments of both secretaries and governors to become vice-chairmen of the National People's Congress (the lower house of the Chinese parliament). Four additional leadership spells are then coded as promotions. In column 7, six more cases where provincial leaders become vice-chairmen of the CPPCC (the upper house of the Chinese parliament) are also coded as promotion. Officially, these positions are ranked higher than provincial leadership positions. Due to the nature of parliaments in the Chinese political regime, they can also be regarded as ceremonial.

Our finding of the complementarity of connections and growth is robust to these different definitions of promotion, with estimated coefficients fairly stable across definitions.

Individual and Province Characteristics   Table 5 conducts a series of robustness checks by controlling for individual or province characteristics and their interactions with (demeaned) growth. Column 1 controls for the age of each provincial leader when assuming office (this variable is thus time-invariant for each leadership spell). Since connected provincial leaders are significantly younger (see Table 3), the connection indicator may pick up the effect of the leader's age. Columns 2 and 3 control for the indicator of having served in the central government before assuming provincial leadership and the indicator of ruling the native province, respectively. Connected provincial leaders may be on the elite career track that includes positions in the central government and various provinces while unconnected ones may tend to rule their native province only. Column 4 controls for provincial growth over the five-year period before assuming leadership. The growth performance of connected officials may reflect the skills to boost the stagnant provincial economy (if connected leaders are assigned to slow-growing provinces) or the ability to rule politically important provinces (if the growth performance of a province, either good or bad, indicates its importance for the central government). Column 5 controls for the indicator of provincial leaders being a princeling, the son or son-in-law of a prominent Communist Party official. Princelings are known as a powerful faction within the Party.[30] Connections to the PSC members may simply reflect the political advantage of being a princeling. Columns 6 and 7 check if connected leaders are simply assigned to provinces that PSC members have a great deal of knowledge about. If this is the case, growth is a stronger signal of the leader's ability, thus explaining the stronger responsiveness of the promotion rate to growth. To measure this feature, we use two variables: an indicator of provinces where current members of the PSC used to work in column 6, and an indicator of provinces where the current members of the PSC were born in column 7. Finally, column 8 controls for all these variables and their interaction with

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[30]The data on princelings come from China Vitae (2012). Xi Jinping, General Secretary since 2012, is a princeling. The media often reported factional struggles between princelings and the former members of the Communist Youth League headed by the outgoing General Secretary Hu Jintao in the lead-up to the 2012 Party Congress.

growth. In all columns, the estimated coefficients on the connection indicator and its interaction term with growth change little from the estimates in column 4 of Table 4, suggesting that the main result is not driven by these omitted variables.

Being the Political Elite Table 6 checks whether our measure of connections simply reflects being a member of China's political elite. A certain set of workplaces may be the home of every top leader in China. As a result, those destined for promotion have worked with the current top leaders in the PSC, and this has nothing to do with social connections between PSC members and provincial leaders.

We check this possibility in two ways. In column 1, we include a measure of connection between provincial leaders and past or future PSC members rather than current members. In column 2, we instead add an indicator for provincial leaders who used to work in the same place as current PSC members but in a different period. They should thus pick up the effect of the elite status, but not of connections. These dummies are set to zero if our main connection indicator is one. Therefore, the coefficients on these variables and their interaction with growth will be the same as those on the connection indicator if connections simply reflect the elite status.

Table 6 shows that the coefficients on these additional regressors are not significantly different from zero. The F-test rejects the null that the effect of being connected to the current members of the PSC is the same as that of being connected to the past or future members of the PSC (column 1) or of working in the same place as current PSC members in a different period (column 2) at the 5% and 10% levels, respectively. The result in column 1 also suggests that our main result cannot be explained by the effect of being trained on the job by a mentor who later joins the PSC.

In column 3, we look at the impact of being connected to current members of the Politburo, the second highest decision-making body in the Communist Party. Connections to the PSC members may simply reflect connections to top politicians in general. If so, connections to the Politburo should also be of importance. However, coefficients on the Politburo connection indicator (set to be zero if the PSC connection indicator is one) and its interaction with growth are not significantly different from zero, and the F-test rejects the equality of these coefficients to those for PSC connections. This result implies that connections to the people with decision-making power count the most.

5.4   Other Connection Sources

Table 7 investigates whether other sources of social connections are of importance for promotion. For this purpose, we replace C_{it} in equation (7) with alternative independent variables. In column 1, we use a dummy that equals one if a provincial leader graduated from the same college as a current PSC member within a period of three years before or after. Such provincial leaders may have met a PSC member while in college. In column 2, we use an indicator of provincial leaders having graduated from the same college as a current PSC

member at any point in time. Graduating from the same college may reduce the cost of communication, even if they did not attend the college at the same time.[31] In column 3, we define connections as being born in the same province, which may also reduce the cost of communication. Table 7 shows that none of these sources of connections have any significant effect on the probability of promotion. One interpretation of these results is that sharing working experience is of greater importance than sharing the same birthplace or knowing each other at college. Another interpretation is that our measures of school and birth place connections are coarser than those based on shared working experience.

5.5 Heterogeneous Impacts by Age Difference

In light of our theoretical framework in Section 3, the estimated complementarity between connections and performance reflects the loyalty-fostering role of connections. However, it is also consistent with connections increasing the PSC's marginal benefit from promoting more able provincial leaders in more general senses. To narrow down the number of possible interpretations of our empirical finding, we investigate whether the complementarity result is stronger for connected pairs in which the provincial leader is much younger than his connected PSC member. Since the 1990s, the Communist Party has undergone generational changes of leadership every ten years. This suggests that party officials of a similar age compete with each other for high office, but different generations of officials do not. Thus, it is plausible to assume that provincial leaders show more loyalty towards connected PSC members whose age is a lot higher than their own. If the complementarity between connections and performance in the promotion process is due to the loyalty-fostering role of connections, we expect a stronger complementarity for the connected pairs in which provincial leaders are substantially younger than the PSC members.

As in Section 5.2, we obtain the age difference between provincial leaders and their connected PSC members by subtracting the PSC member's age from that of the provincial leader.[32] In our sample, provincial leaders are on average 7.1 years younger than their connected PSC members, with a standard deviation of 5.8 years. We include the interactions of this variable with the connection indicator and with the connection-growth interaction term as additional regressors to equation (7). If the age difference makes the complementarity of connections and growth stronger, the coefficient on its interaction with the connection-growth interaction term will be negative.

Table 8 reports the results from this estimation. Column (1) shows that the complementarity between connections and performance are indeed stronger for pairs where provincial leaders are much younger than their connected PSC members. The estimates suggest that a one standard deviation larger age difference raises the coefficient on the interaction between connections and growth by 1.44. As this result may be driven by the provincial leader's own

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[31]Many of the top politicians in China graduated from Tsinghua University, one of the most prestigious colleges in China, and they are known as the Tsinghua clique.

[32]If there are two connected PSC members, we take the minimum (i.e. the maximum in absolute terms).

age, independent of the PSC member's age, column (2) controls for the provincial leader's age when he assumed office (the same variable as the one used in column (1) of Table 5) interacted with the connection indicator and with the connection-growth interaction term. The size of the coefficient on the age difference interacted with the connection-growth interaction term changes little and remains significant at the 10% level. These results imply that the complementarity between connections and performance is indeed due to the loyalty-fostering role of connections rather than to more general benefits of promoting connected officials for the PSC.

6 Discussion

6.1 Interpretations of the Graphical Result

As shown in Figure 2, it is the top one-third of provincial leaders in terms of performance that entirely drive the estimated complementarity between connections and performance. Our theoretical framework in Section 3 can explain this observed pattern by allowing the PSC's survival probability to increase with ability if the promoted official is connected. Specifically, $p(1)$ increases with a_i while $p(0)$ does not. More talented officials may be better at helping top leaders survive as long as they are loyal to them due to their connection.

Figure 2 can also be interpreted as an outcome of bargaining among PSC members. Each member of the PSC may want to promote provincial leaders with whom he is connected. However, the PSC makes decision by consensus, as observed by political scientists (e.g. Shirk 1993). For a provincial leader who is connected to a particular member of the PSC, other PSC members may agree to promote him only when he has achieved high economic growth in his province.

As discussed in Section 3, due to the lack of information on the actual bargaining process of the PSC, together with too few changes of the PSC membership during our sample period, we are unable to empirically disentangle these two interpretations. We leave this issue to future research.

6.2 Implications on Efficiency

What is the implication of our findings for the allocation of talent? Unfortunately, we do not have any good measure of the ability of Chinese politicians once they leave the provincial leadership positions. However, we can look at provincial leaders with more than one spell: (1) secretaries and governors who get transferred to another province without promotion, (2) governors who are promoted and become secretaries of the same or a different province, and (3) secretaries who are promoted by joining the Politburo without leaving the provincial secretary office (see footnote 17). We observe the performance of these leaders after their promotion or non-promotional transfer, measured by the real GDP growth of the new province in which they assume leadership. Although it is a selected sample of provincial

leaders, analyzing this sample sheds some light on whether connected officials are more or less talented than unconnected ones, conditional on the initial performance.

We first regress annual provincial real GDP growth on province and year fixed effects with the full balanced panel data of 31 provinces from 1993 to 2009, and calculate the residuals from this regression. Then, we estimate the following equation

$$\hat{y}_i = \phi C_i + \xi(\hat{g}_i - \bar{g}) + \psi C_i * (\hat{g}_i - \bar{g}) + \omega_i, \tag{8}$$

where $\hat{y}_i$ is average conditional annual real GDP growth for official i during his second term, C_i the connection indicator in the last year of i's first term, $\hat{g}_i$ the average conditional annual real GDP growth for i during his first term, and $\bar{g}$ the sample average of $\hat{g}_i$. A few officials also serve a third term. Such a case is treated as one additional observation for i in our sample so that $\hat{y}_i$ refers to the third term and C_i and $\hat{g}_i$ refer to the second term.

If $\phi \leq 0$ and $\psi < 0$, connected officials with more than the average performance during the first term perform worse than unconnected ones with a similar first-term performance, indicating that the promotion pattern that we observe is inefficient. If $\phi \geq 0$ and $\psi \geq 0$, connected officials perform equally or better than unconnected ones if their first-term performance is more than the average, suggesting that promoting connected officials rather than unconnected ones among best performers may indeed be efficient.

In total, 58 officials serve more than one term of provincial leadership between 1993 and 2009, 13 of which serve three terms. In terms of leader-years, these officials account for 453 observations with a promotion probability of 12.4%. This number is higher than that in the main sample (7%) because part of the sample selection criteria requires the promotion from governors to secretaries and from secretaries to Politburo-member secretaries. In terms of performance and connections, this subsample is more or less comparable to the main sample, however. The average growth measured as the deviation from the whole sample average is 0.005 percentage points, and 18.1% of the leader-years are connected.

Column 1 of Table 9 replicates our main result by restricting the sample to leader-years served by these 58 officials. With this subsample, connected officials are significantly more likely to be promoted than those who are unconnected if their growth performance is average. For unconnected officials, higher growth reduces the promotion probability although this negative correlation is not significant. However, the complementarity between connection and growth does apply to this subset of provincial leaders.

Column 2 of Table 9 reports the result of estimating equation (8). Since first-term growth is demeaned, the coefficient on the connection indicator tells us the difference in the second-term conditional growth between those connected and unconnected whose first-term growth is average, and it is not significantly different from zero. The higher the first-term growth, the higher is the second-term growth, with the coefficient being significant at the 10% level. The coefficient on the connection-growth interaction term is positive but not significantly different from zero. Although not conclusive, these results suggest that promoting connected officials with high performance instead of unconnected ones with similarly high performance

does not appear to be inefficient.

7   Conclusions

The past literature on the promotion of Chinese Communist Party officials looks at the impact of their performance and that of social connections to top politicians separately or assumes no interplay between the two. In this paper, we theoretically show that these two factors can interact, and empirically find that the positive correlation between promotion and performance is robustly stronger for connected officials than for unconnected ones.

Political selection in autocracy often may reflect a trade-off between competence and loyalty (Egorov and Sonin 2011). Appointing competent officials to high office threatens the power of an autocrat. As a result, incompetent but loyal subordinates tend to surround the autocrat, which is one contributing factor to a poor quality of government in autocracy.

Our evidence might suggest that China avoids this trap. A system of job rotation and promotion within the Communist Party might help pairs of officials build trust by working together. Within a pool of officials with such connections, top officials may then be able to pick the most able without being threatened. In this view, what we may call patronage or nepotism does not necessarily result in an inefficient allocation of talent. We leave testing this hypothesis to future research.

A   Appendix

A.1   A model of promotion as an incentive scheme

An alternative model of promotion is that the PSC cares about provincial economic growth per se, not the ability of those to be promoted. Promotion is used as an incentive scheme where growth is determined by provincial leaders' effort, not their ability.

Suppose that the PSC derives the utility from the share of tax revenues in province i that its leader i (with his connection status C_i) contributes to them. Assuming that tax revenues increase with growth, g_i, we can write the PSC's payoff as follows:

$$\alpha(C_i)g_i,$$

where $\alpha(C_i)$ is the extent to which provincial leader i shares his province's tax revenue with the PSC. We have $\alpha(1) > \alpha(0)$ if connections make provincial leaders more obliged to share their tax revenue with the PSC. If unconnected provincial leaders need to share more tax revenues with the PSC to compensate for the lack of loyalty through connections, we have $\alpha(1) < \alpha(0)$.

Economic growth in province i is determined by:

$$g_i = e_i + \varepsilon_i,$$

where e_i is the effort exerted by the leader of province i and ε_i the stochastic shock to growth, distributed by the cumulative distribution function G with mean 0.

Provincial leader i obtains the payoff of r if promoted and zero otherwise, and the disutility from making an effort for i is $\kappa(e_i)$ with $\kappa' > 0$ and $\kappa'' > 0$.

Assume that the PSC can commit to promoting provincial leader i if $\alpha(C_i)g_i \geq \bar{u}$, where $\bar{u}$ is the performance of an alternative candidate. For simplicity, we assume $\bar{u}$ to be uniformly distributed in the interval $[-1/2\nu, 1/2\nu]$.

We first analyze the provincial leader's behavior. The probability of promotion given e_i is:

$$Pr(\alpha(C_i)(e_i + \varepsilon_i) \geq \bar{u}) = \int \left[\frac{1}{2} + \nu\alpha(C_i)(e_i + \varepsilon_i)\right] dG(\varepsilon_i)$$
$$= \frac{1}{2} + \nu\alpha(C_i)e_i,$$

with the last equality by $\int \varepsilon_i dG(\varepsilon_i) = 0$.

Provincial leader i chooses e_i to maximize

$$\left[\frac{1}{2} + \nu\alpha(C_i)e_i\right]r - \kappa(e_i).$$

The first-order condition is given by

$$\nu\alpha(C_i)r = \kappa'(e_i).$$

By $\kappa'' > 0$, there is the unique solution for e_i, $e_i^*(C_i)$, with $e_i^*(1) > e_i^*(0)$ if and only if $\alpha(1) > \alpha(0)$.

Given this optimal behavior, we now look at the marginal probability of promotion with respect to growth. Once ε_i is observed, the probability of promotion is given by

$$Pr(\alpha(C_i)g_i \geq \bar{u}) = \frac{1}{2} + \nu\alpha(C_i)g_i.$$

Differentiating this expression with respect to g_i yields:

$$\frac{\partial Pr(\alpha(C_i)g_i \geq \bar{u})}{\partial g_i} = \nu\alpha(C_i).$$

Consequently, if we have $\alpha(1) > \alpha(0)$, this expression is larger for $C_i = 1$ and thus connections and growth are complementary. If $\alpha(1) < \alpha(0)$, they are substitutes.

The above argument depends on the assumption that the PSC's commitment to this

promotion scheme is credible. Once growth has been realized, the PSC is indifferent between promoting the high-performing provincial leader and reneging on the promise (and even prefers not promoting if promotion is costly). Credible commitment is plausible if the PSC expects to remain in power for a certain period of time and thus needs to build the reputation to reward good performance for future provincial leaders. Otherwise, we need an assumption that the PSC cares about the ability of those promoted so that the PSC has an incentive to promote those who have achieved high growth (see Fairburn and Malcomson 2001).

A.2 Model extensions

General distribution of $\bar{u}$ In the main text, we assume that $\bar{u}$, the payoff of not promoting provincial leader i, is uniformly distributed. If we instead impose no restriction on the cumulative distribution function of $\bar{u}$, F, equation (4) becomes

$$\frac{\partial F(W_i^{C_i})}{\partial g_i} = f(W_i^{C_i})\eta p(C_i)h(C_i),$$

where f is the probability density function of $\bar{u}$. As a result, connections and growth are complementary if

$$\frac{p(1)}{p(0)} > \frac{f(W_i^0)}{f(W_i^1)}\frac{h(0)}{h(1)},$$

and substitutes if the opposite inequality holds.

Since $W_i^{C_i}$ depends on g_i, whether connections and growth are complementary or substitutes may change with g_i. Denote the relative importance of the loyalty-fostering role of connections to their informational role by

$$\xi \equiv \frac{p(1)/p(0)}{h(0)/h(1)}$$

so that if $f(W_i^0)/f(W_i^1) < \xi$, connections and growth are complementary. Below we show that for sufficiently high ξ, complementarity holds for a wide range of g_i around the mean growth (i.e. $\bar{a}$). We also show that substitutability holds for a wide range of g_i around $\bar{a}$ for sufficiently low ξ.

First, suppose that $\xi > 1$. With the uniform distribution of $\bar{u}$, this condition implies complementarity of connections and growth. It also implies that the difference in payoffs from promoting connected and unconnected provincial leaders with the same growth performance, $W_i^1 - W_i^0$, monotonically increases with g_i. Let $\hat{g}$ be the growth rate that equates W_i^1 and W_i^0. Since $W_i^1 > W_i^0$ at $g_i = \bar{a}$, we know that $\hat{g} < \bar{a}$.

At $g_i = \hat{g}$, $f(W_i^0)/f(W_i^1) = 1$, suggesting that connections and growth are complements. When $\partial f(W_i^{C_i})/\partial W_i^{C_i} > 0$ (e.g. $\bar{u}$ being normally distributed with the equilibrium promotion probability less than a half), $f(W_i^0)/f(W_i^1)$ decreases with g_i because W_i^1 becomes larger

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than W_i^0. Therefore, there exists $\bar{g}^c < \hat{g}$ such that connections and growth are complementary for all $g_i > \bar{g}^c$. On the other hand, when $\partial f(W_i^{C_i})/\partial W_i^{C_i} < 0$ (e.g. $\bar{u}$ follows the Pareto distribution), $f(W_i^0)/f(W_i^1)$ increases with g_i. There exists $\tilde{g}^c > \hat{g}$ such that connections and growth are complementary for all $g_i < \tilde{g}^c$. As $\tilde{g}^c$ increases with ξ, we have $\tilde{g}^c > \bar{a}$ for a large enough ξ. Thus, for a range of g_i around $\bar{a}$, connections and growth are complementary under general distributions of $\bar{u}$ if $\xi > 1$.

Second, suppose instead that $\xi < 1$, under which connections and growth are substitutes if $\bar{u}$ follows the uniform distribution. In this case, $W_i^1 - W_i^0$ monotonically decreases with g_i. As $W_i^1 > W_i^0$ at $g_i = \bar{a}$, this implies that $\hat{g} > \bar{a}$.

At $g_i = \hat{g}$, $f(W_i^0)/f(W_i^1) = 1$, suggesting that connections and growth are substitutes. When $\partial f(W_i^{C_i})/\partial W_i^{C_i} > 0$, $f(W_i^0)/f(W_i^1)$ increases with g_i, suggesting that there exists $\bar{g}^s$ such that connections and growth are substitutes for all $g_i > \bar{g}^s$. With a small enough ξ, we have $\bar{g}^s < \bar{a}$. In the case of $\partial f(W_i^{C_i})/\partial W_i^{C_i} < 0$, $f(W_i^0)/f(W_i^1)$ decreases with g_i. There exists $\tilde{g}^s > \hat{g}$ such that connections and growth are substitutes for all $g_i < \tilde{g}^s$.

PSC's survival probability decreases with ability   The probability for the PSC members of remaining in power, $p(C_i)$, may depend on a_i. If $p(C_i)$ increases with a_i, it would act in a similar way to a_i in the PSC's utility function. Consequently, our results are robust. A more interesting, and probably more plausible, case is when $p(0)$ decreases with a_i while $p(1)$ does not depend on a_i. In other words, more able officials threaten the power of the incumbent PSC members, and this effect is weaker if the officials are connected because connected officials are loyal to the PSC members.

Denote this probability by $p(C_i, a_i)$. Since a_i is unobservable, the PSC forms an expectation on the probability of survival from observed growth, which is given by

$$\int p(C_i, a_i)\phi(a_i|g_i)da_i,$$

where $\phi(a_i|g_i)$ is the posterior probability density function of a_i given g_i.

In this setting, equation (4) becomes

$$\frac{\partial F(W_i^{C_i})}{\partial g_i} = f(W_i^{C_i})\Big[\eta h(C_i)\int p(C_i, a_i)\phi(a_i|g_i)da_i$$
$$+ (R + \eta(h(C_i)g_i + (1 - h(C_i))\bar{a}))\int p(C_i, a_i)\frac{\partial \phi(a_i|g_i)}{\partial g_i}da_i\Big].$$

The second term in the square brackets is zero for $C_i = 1$. For $C_i = 0$, it is negative for $g_i > \bar{a}$ because we have $\partial p(0, a_i)/\partial a_i < 0$ and $\partial^2 \phi(a_i|g_i)/\partial g_i a_i > 0$. It is positive if $g_i < \bar{a}$.

This implies that $F(W_i^0)$ is a concave function. If $\xi > 1$, the complementarity may not hold for a low value of g_i. If $\xi < 1$, substitutability may not hold for a high value of g_i. In both cases, however, a sufficiently high (low) ξ preserves the complementarity (substitutability) of connections and growth for a wide range of g_i.

Strategic provincial leader   Given the promotion scheme, it is natural for provincial leaders to exert an effort to boost the economic growth of the province. Now, we modify the model to incorporate such strategic behavior of the provincial leader. Provincial leader i obtains the payoff of r if promoted and zero otherwise. Provincial growth, g_i, is now determined by the following equation:

$$g_i = a_i + e_i + \varepsilon_i, \tag{9}$$

where e_i is the effort made by i.[33] The disutility from making an effort for i is $\kappa(e_i)$ with $\kappa' > 0$ and $\kappa'' > 0$. The timing of events is as follows. First, nature picks the value of a_i, unobservable to both the PSC and the provincial leader.[34] Second, provincial leader i chooses e_i. Third, nature picks the value of ε_i, and thus g_i is observed by all players. Finally, the PSC decides whether to promote i.

The expected ability conditional on the observed growth is now given by

$$E(a_i|g_i) = h(C_i)(g_i - \tilde{e}_i) + [1 - h(C_i)]\bar{a}, \tag{10}$$

where $\tilde{e}_i$ denotes the optimal choice of effort by i. When choosing e_i, provincial leader i knows that the PSC will promote i if

$$p(C_i)\Big[R + \eta\big[h(C_i)(a_i + e_i + \varepsilon_i - \tilde{e}_i) + [1 - h(C_i)]\bar{a}\big]\Big] \geq \bar{u}. \tag{11}$$

Provincial leader i maximizes the probability that this condition holds. Since i does not know his own ability, this condition suggests that the optimal effort level only differs by C_i. Denote this optimal effort by $e^*(C_i)$. Once g_i has been observed, the probability of i's promotion is

$$F\Big[p(C_i)\big[R + \eta\{h(C_i)[g_i - e_i^*(C_i)] + [1 - h(C_i)]\bar{a}\}\big]\Big],$$

where we exploit $\tilde{e} = e_i^*(C_i)$ by rational expectation. Differentiating this expression with respect to g_i yields equation (4).

Connections affect the average ability   The average ability, $\bar{a}$, may depend on C_i. Since connected provincial leaders are known to the PSC members when they assume provincial

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[33]We might consider a situation where ability and effort are complements: $g_i = a_i e_i + \varepsilon_i$. This case is intractable to analyze although it can be shown that the interdependence between connections and growth now depends on the equilibrium effort level as well as on $p(C_i)$ and $h(C_i)$, which may or may not offset the connection effects.

[34]The assumption that the provincial leader does not know his own ability follows the standard career-concern model (Holmström 1982; Persson and Tabellini 2000). It implies that a provincial leader does not know ex ante to what extent he is capable of running a provincial economy and of running the central government if promoted. This assumption certainly affects the optimal effort choice by provincial leaders. However, as we will see, the interdependent role of connections and growth in promotion does not hinge on the optimal effort level. Thus, this assumption is innocuous for our purpose.

office, they are likely to be a selected sample of officials with higher ability: $\bar{a}(C_i = 1) > \bar{a}(C_i = 0)$. Alternatively, connected provincial leaders are those relying on connections to climb the promotion ladder in the Communist Party while unconnected ones are those relying on their competence. In this case, we would have $\bar{a}(C_i = 1) < \bar{a}(C_i = 0)$.

With the uniform distribution of $\bar{u}$, allowing $\bar{a}$ to depend on C_i does not affect the analysis as $\partial F(W_i^{C_i})/\partial g_i$ does not depend on a_i. However, the above analysis with more general distribution functions of $\bar{u}$ changes as follows. ξ needs to be much larger for complementarity to hold if $\xi > 1$ and $\partial f(W_i^{C_i})/\partial W_i^{C_i} < 0$ while it needs to be much lower for substitutability to hold if $\xi < 1$ and $\partial f(W_i^{C_i})/\partial W_i^{C_i} > 0$. This is because $\bar{a}(C_i = 1) > \bar{a}(C_i = 0)$ makes $W_i^1 - W_i^0$ larger, thus moving $\hat{g}$ further away from $\bar{a}$.

Connections reduce the variance of growth shock The variance of the growth stochastic shock, σ_ε, may depend on C_i. If σ_ε is smaller for $C_i = 1$, $h(C_i)$ in equation (3) can be larger for $C_i = 1$. As a result, condition (6) is less likely to hold, and thus the substitutability between connections and performance is less likely to be observed even if we have $\sigma_a(1) < \sigma_a(0)$.

A.3 Definition of variable names used in tables

A.3.1 Measures of promotion

Promoted The indicator of getting promoted where promotion is defined as becoming a member of the Politburo, a Vice Premier, and a State Councilor for secretaries, a member of the PSC for Politburo-member secretaries, and a provincial secretary for governors.

Minister The indicator of getting promoted according to the definition of promotion that includes becoming a minister for governors.

NPC The indicator of getting promoted according to the definition of promotion that further includes becoming the vice-chairman of the NPC for both secretaries and governors.

CPPCC The indicator of getting promoted according to the definition of promotion that further includes becoming the vice-chairman of the CPPCC for both secretaries and governors.

A.3.2 Measures of connection

Connection The indicator of being connected to at least one of the current members of the PSC where connection is defined as working in the same workplace in the same period in the past.

Class   The indicator of being connected to at least one of the current members of the PSC where connection is defined as graduating from the same college within a range of three years.

Alumni   The indicator of being connected to at least one of the current members of the PSC where connection is defined as graduating from the same college irrespective of the graduation year.

Birth province   The indicator of being connected to at least one of the current members of the PSC where connection is defined as being born in the same province.

A.3.3   Leadership spell level variables

Term length   The number of years in office.

A.3.4   Other time-variant variables

Growth   The average annual real provincial GDP growth since assuming office minus the sample mean of the 966 leader-year observations.

PSC work province   The indicator of ruling the province where at least one current member of the PSC used to work.

PSC home province   The indicator of ruling the province where at least one current member of the PSC was born.

Future/past connection   The indicator of being unconnected to any current members of the PSC but being connected to at least one past or future member of the PSC, where connection is defined as working in the same workplace in the same period in the past.

Transfer from center   The fiscal transfer from the central government to the province that the provincial leader is ruling.

Workplace   The indicator of being unconnected to any current members of the PSC but having worked in the workplace in which at least one current member of the PSC used to work in a different period.

Politburo connection   The indicator of being unconnected to any current members of the PSC but being connected to at least one member of the Politburo, where connection is defined as working in the same workplace in the same period in the past.

A.3.5 Other time-invariant variables

Age   The age in the year of assuming office (thus time-invariant for each leadership spell).

Previous growth   The average annual real provincial GDP growth for the five-year period before assuming office.

College graduate   The indicator of having graduated from college.

Served in center   The indicator of having assumed positions in the central government.

Home   The indicator of ruling the province where the provincial leader was born.

Princeling   The indicator of being a princeling (i.e. the son or the son-in-law of a prominent Communist Party official)

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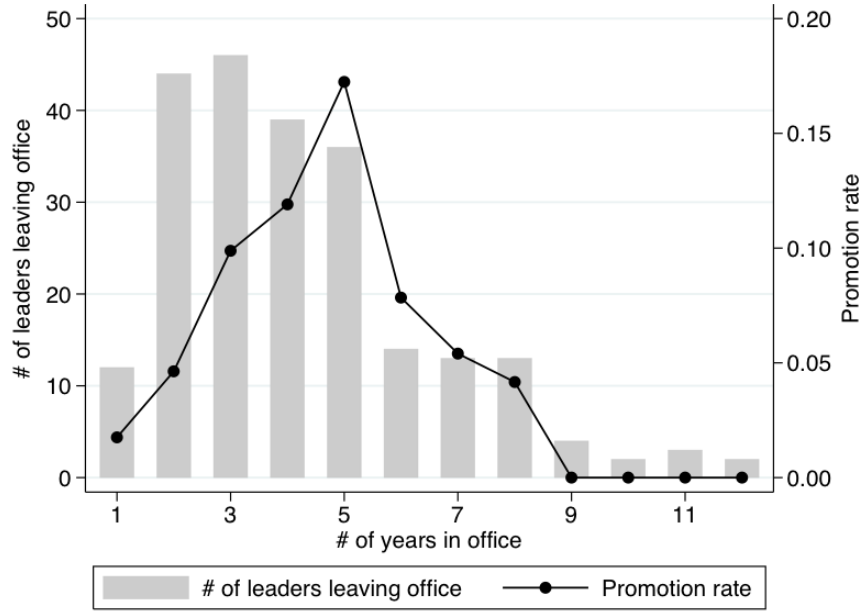
FIGURE 1: DISTRIBUTION OF TERM LENGTHS AND PROMOTION RATES BY NUMBER OF YEARS IN OFFICE

Notes: See the text for how this graph is constructed.
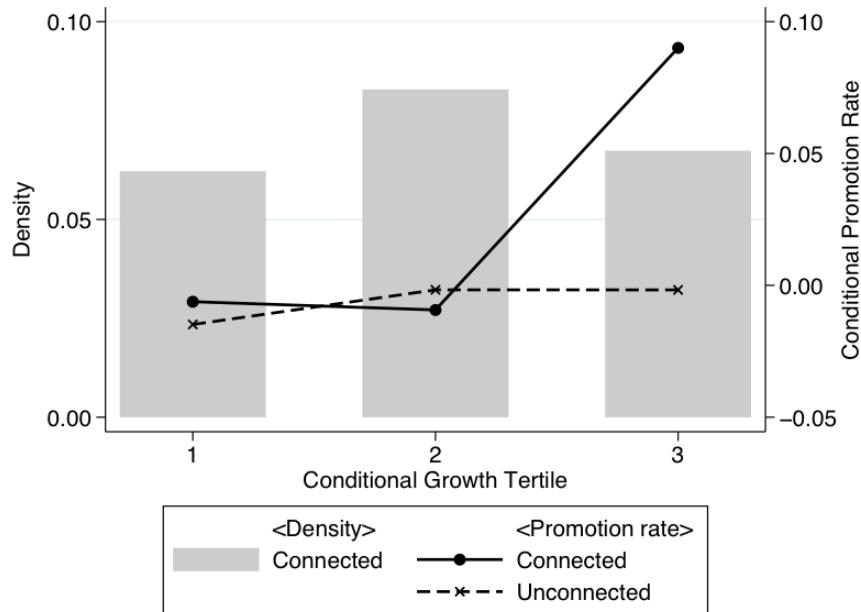
FIGURE 2: PROMOTION-GROWTH RELATIONSHIP BY CONNECTION

Notes: See the text for how this graph is constructed.

TABLE 1: DESCRIPTIVE STATISTICS

	(1) All spells	(2) Secretary spells	(3) Governor spells	(4) Leader years
Measures of promotion				
Promoted	0.26	0.18	0.34	0.07
Minister	0.29	0.18	0.40	0.08
NPC	0.31	0.19	0.42	0.08
CPPCC	0.33	0.22	0.45	0.09
Measures of connections				
Connection	0.25	0.27	0.23	0.21
Class	0.07	0.07	0.07	0.05
Alumni	0.12	0.13	0.11	0.10
Birth province	0.41	0.44	0.39	0.36
Growth	0.11	0.11	0.11	0.11
	(0.02)	(0.02)	(0.02)	(0.02)
Term length	4.29	4.39	4.18	3.23
	(2.27)	(2.42)	(2.12)	(2.14)
Time-invariant covariates				
Age	56.82	57.82	55.80	56.60
	(4.10)	(4.09)	(3.86)	(3.80)
Previous growth	0.11	0.11	0.11	0.11
	(0.02)	(0.02)	(0.03)	(0.02)
College graduate	0.82	0.82	0.82	0.82
Served in center	0.40	0.43	0.36	0.36
Home	0.23	0.15	0.31	0.26
Princeling	0.05	0.05	0.04	0.04
Time-variant covariates				
PSC work province	0.24	0.24	0.23	0.24
PSC home province	0.26	0.25	0.28	0.22
Future/past connection	0.21	0.22	0.21	0.18
Workplace	0.31	0.35	0.27	0.24
Politburo connection	0.27	0.27	0.27	0.21
Observations	258	130	128	966

Notes: Reported in each cell is the sample mean (and standard deviation in parentheses for continuous variables). The sample includes all leadership spells in column (1), provincial secretary spells in column (2), provincial governor spells in column (3) and leader-years in column (4). See Appendix Section A.3 for variable definitions. In columns (1)-(3), measures of promotion and *Growth* refer to the last year of the spell; measures of connections and time-variant covariates are the maximum value during the spell.

TABLE 2: COMPLEMENTARITY BETWEEN CONNECTIONS AND GROWTH

Dependent variable:	(1) Promoted	(2) Promoted	(3) Promoted	(4) Promoted	(5) Minister	(6) NPC	(7) CPPCC
Connection	0.049**		0.048**	0.032	0.038	0.033	0.023
	(0.023)		(0.023)	(0.023)	(0.026)	(0.026)	(0.026)
Growth		0.702	0.690	0.356	0.441	0.328	0.273
		(0.465)	(0.447)	(0.427)	(0.452)	(0.460)	(0.423)
Connection * Growth				2.195**	2.309**	2.201**	2.374**
				(0.889)	(0.869)	(0.915)	(0.919)
				[0.056]*	[0.028]**	[0.050]*	[0.032]**
Fixed Effects	Y	Y	Y	Y	Y	Y	Y
# clusters	31	31	31	31	31	31	31
# observations	966	966	966	966	966	966	966

Notes: Standard errors clustered at the province level are reported in parenthesis. Reported in brackets are the *p*-values for the significance of the coefficient on *Connection* * *Growth* by the wild cluster bootstrap-t (Cameron et al. 2008). See Appendix Section A.3 for variable definitions. However, the variable *Growth* is normalized by subtracting the sample mean. All columns control for dummies of the number of years in office (two to twelve), office-by-province fixed effects, and office-by-year fixed effects.
* Significant at 10%, ** 5%, *** 1%.

TABLE 3: DO CONNECTED LEADERSHIP SPELLS DIFFER FROM UNCONNECTED ONES?

	(1) Connected	(2) Unconnected	(3) *t*-value	(4) Conditional difference
Promoted	0.35	0.24	1.73*	0.21***
				[0.08]
Tenure length	3.76	4.36	-1.90*	0.18
	(1.66)	(2.38)		[0.29]
Growth	0.12	0.11	3.72***	0.00
	(0.02)	(0.02)		[0.00]
Age	55.26	57.20	-3.05***	-3.35***
	(4.21)	(3.99)		[0.88]
Previous growth	0.12	0.10	2.92***	0.00
	(0.02)	(0.03)		[0.00]
College graduate	0.88	0.82	1.27	0.05
				[0.07]
Served in center	0.53	0.37	2.35**	0.20*
				[0.12]
Home	0.10	0.25	-2.43**	-0.06
				[0.07]
Princeling	0.06	0.04	0.50	0.00
				[0.07]
PSC work province	0.51	0.14	6.12***	0.16*
				[0.08]
PSC home province	0.29	0.22	0.88	0.07
				[0.07]
Observations	50	208		258
Transfer from center	4649.74	3133.91	2.79***	26.53
(in million RMB)	(3855.64)	(3280.62)		[507.86]
Observations	49	198		247

Notes: The unit of observations is the leadership spell. Columns (1) and (2) report the mean (and standard deviation for continuous variables) for those spells where the provincial leader is connected and unconnected, respectively, to the PSC in the first year of the spell. Column (3) reports t-statistics for the null that the means in columns (1) and (2) are the same. Column (4) reports the estimated coefficient on the connection status in the first year of the spell (and robust standard errors in brackets) from a regression of each variable on the connection indicator, office-by-province dummies, and office-by-year dummies. See Appendix Section A.3 for variable definitions. To aggregate leader-year level data to the spell level, we take the last year observation for *Promoted* and *Growth*, the first year observation for *PSC work province* and *PSC home province*, and the annual average for *Transfer from center*.
* Significant at 10%, ** 5%, *** 1%.

TABLE 4: DOES PROVINCIAL ECONOMIC GROWTH REFLECT THE SUPPORT FROM THE CENTRAL GOVERNMENT?

(Dependent variable: Annual real provincial GDP growth)

	(1) Secretaries	(2) Governors	(3) Secretaries	(4) Secretaries	(5) Governors	(6) Governors
1 year after promotion	0.006 (0.004)	0.001 (0.004)				
2 years after promotion	0.003 (0.005)	0.002 (0.004)				
3 years after promotion	0.003 (0.003)	-0.001 (0.003)				
Connection			-0.005 (0.005)	-0.004 (0.006)	-0.009 (0.005)	0.002 (0.006)
Years of working together * Connection			0.001 (0.001)		0.003** (0.001)	
Age difference * Connection				-0.000 (0.001)		-0.000 (0.001)
Fixed Effects	Y	Y	Y	Y	Y	Y
# clusters	31	31	31	31	31	31
# observations	488	478	488	488	478	478

Notes: Standard errors clustered at the province level are reported in parenthesis. The unit of observations is the province-by-year. The variable *x year after promotion* is a dummy for *x* years after the previous leader in the same province has been promoted. *Connection* is the indicator of the provincial leader having worked together in the past with any of the current members of the Politburo Standing Committee. *Years of working together* is the (average, if more than one connection) number of years that the provincial leader has worked together with the current member(s) of the Politburo Standing Committee. *Age difference* is the (minimum, if more than one connection) difference in age between the provincial leader and his connected member(s) of the Politburo Standing Committee. In columns (1), (3) and (4), the provincial leaders to define these variables are provincial secretaries; in columns (2), (5), and (6), provincial governors. All columns control for province fixed effects and year fixed effects.
* Significant at 10%, ** 5%, *** 1%.

TABLE 5: ROBUSTNESS TO CONTROLLING FOR POTENTIAL CONFOUNDING VARIABLES WITH THE CONNECTION INDICATOR

(Dependent variable: Promoted)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Connection	0.012	0.029	0.029	0.029	0.026	0.043	0.029	0.014
	(0.024)	(0.024)	(0.024)	(0.023)	(0.024)	(0.027)	(0.023)	(0.029)
Growth	1.530	0.210	0.347	2.815*	0.171	0.317	0.363	1.378
	(5.289)	(0.471)	(0.397)	(1.613)	(0.435)	(0.430)	(0.402)	(5.882)
Connection * Growth	2.096***	1.983**	2.173**	2.429**	2.150**	2.222**	2.222**	2.309**
	(0.732)	(0.769)	(0.817)	(0.985)	(0.901)	(1.004)	(0.882)	(0.845)
	[0.032]**	[0.058]*	[0.032]**	[0.064]*	[0.080]*	[0.098]*	[0.066]*	[0.042]**
Age	-0.009***							-0.008***
	(0.003)							(0.003)
Age * Growth	-0.023							0.018
	(0.094)							(0.105)
Served in center		0.026						0.033
		(0.025)						(0.024)
Served in center * Growth		0.607						0.707
		(0.670)						(0.840)
Home			-0.037					-0.040
			(0.029)					(0.030)
Home * Growth			0.074					0.316
			(0.840)					(0.939)
Previous Growth				0.155				-0.152
				(0.462)				(0.419)
Previous Growth * Growth				-22.428				-24.499*
				(13.519)				(13.914)
Princeling					-0.042			-0.077**
					(0.036)			(0.029)
Princeling * Growth					2.936			2.639
					(1.902)			(1.902)
PSC Work Province						-0.039		-0.062**
						(0.034)		(0.027)
PSC Work Province * Growth						-0.400		-0.704
						(1.237)		(1.133)
PSC Home Province							0.039*	0.046**
							(0.022)	(0.019)
PSC Home Province * Growth							-0.259	-0.346
							(0.842)	(0.712)
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
# clusters	31	31	31	31	31	31	31	31
# observations	966	966	966	966	966	966	966	966

Notes: Standard errors clustered at the province level are reported in parenthesis. Reported in brackets are the *p*-values for the significance of the coefficient on *Connection * Growth* by the wild cluster bootstrap-t (Cameron et al. 2008). See Appendix Section A.3 for variable definitions. However, the variable *Growth* is normalized by subtracting the sample mean. All columns control for dummies of the number of years in office (two to twelve), office-by-province fixed effects, and office-by-year fixed effects.

* Significant at 10%, ** 5%, *** 1%.

TABLE 6: CONNECTIONS OR BEING PART OF THE POLITICAL ELITE?
(Dependent variable: Promoted)

	(1)	(2)	(3)
Connection	0.033	0.043*	0.037
	(0.028)	(0.022)	(0.027)
Growth	0.414	0.234	0.395
	(0.483)	(0.507)	(0.479)
Connection * Growth	2.125**	2.351**	2.157**
	(0.938)	(0.902)	(0.903)
	[0.090]*	[0.044]**	[0.058]*
Future/Past Connection	0.005		
	(0.027)		
Future/Past Connection * Growth	-0.265		
	(1.059)		
Workplace		0.026	
		(0.028)	
Workplace * Growth		0.285	
		(0.742)	
Politburo Connection			0.013
			(0.019)
Politburo Connection * Growth			-0.234
			(0.653)
F-test	3.27	2.61	3.96
	[0.052]	[0.090]	[0.030]
Fixed Effects	Y	Y	Y
# clusters	31	31	31
# observations	966	966	966

Notes: Standard errors clustered at the province level are reported in parenthesis. Reported in brackets are the *p*-values for the significance of the coefficient on *Connection * Growth* by wild cluster bootstrap-t (Cameron et al. 2008). See Appendix Section A.3 for variable definitions. However, the variable *Growth* is normalized by subtracting the sample mean. All columns control for dummies of the number of years in office (two to twelve), office-by-province fixed effects, and office-by-year fixed effects. *F-test* reports F-statistics and their associated p-values for the null that the coefficients on *Connection* and on *Future/Past Connection* in column (1), *Workplace* in column (2), or *Politburo Connection* in column (3), are the same and that the coefficients on their respective interaction terms with *Growth* are also the same.
* Significant at 10%, ** 5%, *** 1%.

TABLE 7: OTHER SOURCES OF CONNECTIONS
(Dependent variable: Promoted)

Definition of connection:	(1) Class	(2) Almuni	(3) Birth province
Other connection	0.117	0.061	0.000
	(0.071)	(0.046)	(0.020)
Growth	0.662	0.750	0.564
	(0.442)	(0.531)	(0.538)
Other connection * Growth	-0.177	-0.589	0.458
	(1.851)	(1.232)	(0.787)
	[0.940]	[0.634]	[0.590]
Fixed Effects	Y	Y	Y
# clusters	31	31	31
# observations	966	966	966

Notes: Standard errors clustered at the province level are reported in parenthesis. Reported in brackets are the *p*-values for the significance of the coefficient on *Other connection * Growth* by wild cluster bootstrap-t (Cameron et al. 2008). The variable *Other connection* refers to the variable mentioned at the top of each column. See Appendix Section A.3 for variable definitions. However, the variable *Growth* is normalized by subtracting the sample mean. All columns control for dummies of the number of years in office (two to twelve), office-by-province fixed effects, and office-by-year fixed effects.
* Significant at 10%, ** 5%, *** 1%.

TABLE 8: DOES A LARGER AGE DIFFERENCE MAKE COMPLEMENTARITY STRONGER?

	(1)	(2)
Connection	-0.004	0.471
	(0.026)	(0.374)
Connection	-0.005*	-0.002
* Age difference	(0.003)	(0.003)
Connection		-0.008
* Age		(0.006)
Growth	0.295	0.372
	(0.446)	(0.440)
Connection	0.310	-5.230
* Growth	(0.992)	(14.305)
Connection		
* Growth	-0.247**	-0.271*
* Age difference	(0.102)	(0.135)
Connection		
* Growth		0.091
* Age		(0.237)
Fixed Effects	Y	Y
# clusters	31	31
# observations	966	966

Notes: Standard errors clustered at the province level are reported in parenthesis. *Age difference* is the (minimum, if more than one connections) difference in age between the provincial leader and his connected member(s) of the Politburo Standing Committee. See Appendix Section A.3 for other variable definitions. However, the variable *Growth* is normalized by subtracting the sample mean. All columns control for dummies of the number of years in office (two to twelve), office-by-province fixed effects, and office-by-year fixed effects.
* Significant at 10%, ** 5%, *** 1%.

TABLE 9: IS THE COMPLEMENTARITY OF CONNECTIONS AND PERFORMANCE INEFFICIENT?

Dependent variable:	(1) Promoted	(2) Second-term Growth
Connection	0.081**	0.004
	(0.035)	(0.004)
Growth	-0.309	0.162*
	(1.007)	(0.094)
Connection * Growth	2.568*	0.167
	(1.352)	(0.121)
	[0.140]	
Observations	453	71

Notes: In column (1), the unit of observations is the leader-year. The sample is restricted to those who assume provincial leadership positions more than once. The definition of variables is the same as in column 4 of Table 2. Standard errors clustered at the province level are reported in parenthesis. Reported in brackets is the *p*-value for the significance of the coefficient on *Connection * Growth* by wild cluster bootstrap-t (Cameron et al. 2008). In column (2), the leadership spell is the unit of observation. The sample is restricted to those who serve the second or third term of provincial leadership. The dependent variable is average annual growth during the tenure conditional on province and year fixed effects in a balanced province panel regression. *Connection* is an indicator of being connected in the last year of the previous term. *Growth* is the deviation of average conditional annual growth during the previous term from the sample average. No other variables are included as regressors. Robust standard errors are reported.

* Significant at 10%, ** 5%, *** 1%.