The Bright Side of Patron-Client Network: Evidence from Corporate Innovation

Abstract

Patron–client networks (PCNs) are often perceived as impediments to effective political governance in transitional economies and have adverse impacts on aggregated economic outputs. This study advances an alternative view that emphasizes their enabling effects. To do so, we use a new method that identifies patronage ties based on past promotions. Our study shows that PCNs can foster innovation at the micro-economic level. Firms situated in cities where city leaders have patronage connections with provincial leaders experience an 8.7% and 7.9% increase in innovation output and citation rates, respectively. Our results remain robust after using alternative measures of corporate innovation, alternative estimation strategies, controlling for high dimensional fixed effects, alternative cluster levels, controlling for city leaders' personal characteristics, and using subsample analysis. We also conduct additional analyses to rule out several important alternative explanations. We find that PCNs enhance corporate innovation by fostering mutual trust between government hierarchies, facilitating more favorable resource allocation, promoting city leaders' tolerance of failure, and mitigating economic policy uncertainty and other perceived uncertainty faced by firms. We also find that PCNs operate primarily through patronage connections with provincial party secretaries, rather than with provincial governors. The impact of PCNs is more pronounced among local state-owned enterprises and in the absence of robust external institutions. Overall, our results highlight the importance of PCNs in providing an alternative form in political governance and functioning for authoritarian governments, promoting firm-level innovation efficiency and fostering economic growth.

Key words: Patron-client Network, Innovation, Policy uncertainty

1. Introduction

Patron-client networks (PCNs) form the foundation of political systems in both authoritarian and democratic economies (Grindle, 2012), which play an important role in structuring political functioning within various systems (Brehm & Gates, 1994). One typical form of PCNs is the appointment of individuals to governmental positions (i.e., clients) based on personal traits such as ethnicity, race, gender, or social connections (Colonnelli et al., 2020; Schuster, 2013). These appointees then hold office and allocate resources and rents to group members at high social costs[1], especially benefiting the patrons[2,3]. Accordingly, PCNs have always been a central mechanism through which political regimes shape the patterns of elite selection, allocate public resources and determine the trajectory of public policies (Arriola, 2009; Bendor et al., 2001), and hierarchical relationships characterized by reciprocal benefits among bureaucrats and politicians serve as a basic form for regulating interactions among political elites (Stokes, 2005; Xu, 2019).

How PCN impacts economic growth remains inconclusive. Most existing research in the context of various political regimes shows consistent evidence on the negative role of PCNs in government performance and economic growth. PCNs have a tendency to impede a government's capacity to effectively fulfill its public obligations by breeding corruption (Quah, 2017; Shleifer & Vishny, 1993), distorting political incentives (Geddes, 1994), and subverting formal accountability mechanisms (Stokes,

[1] Rent-transfers take various forms, for example favorable access to credit (Khwaja et al., 2005; Claessens et al., 2008; Li et al., 2008), government funds (Faccio et al., 2006, Duchin et al., 2012), and government contracts (Kim, 2018; Baltrunaite, 2019; Schoenherr, 2019), or laxer enforcement of regulations (Fisman and Wang, 2015).

[2] In this paper, we use the term "client" to refer to the appointee and "patron" to refer to the person appointing the appointee.

[3] "Patronage" refers to the discretionary appointment of individuals to governmental or political positions (Webster's II New College Dictionary 1995).

2005). The negative role of PCNs is frequently highlighted in comparative analyses of country-level economic development outcomes, often cited as an explanation for the economic underperformance in developing countries (Goldsmith, 1999; Zon, 2001).[4] In fact, a central theme advocated by United Nations Development Program highlights the importance of transition from traditional, patronage-based administrative structures to government bureaucracies characterized by principles of meritocracy and rule-based management.

However, recent literature suggests that PCN can be used for more benevolent goals, particularly in authoritarian regimes in certain developing nations (Jiang, 2018; Jiang & Zhang, 2020; Toral, 2023). This includes its role in incentivizing officials and boosting government efficiency (Toral, 2022), contributing to elections (Akhtari et al., 2022), and regime stability (Folke et al., 2011). Most existing literature suggests that PCN contributes to the stability in authoritarian regimes.

In authoritarian regimes, innovation has traditionally been seen as incompatible with political and economic stability (Beraja et al., 2023). Autocratic governments often suppress innovation incentives due to the risks of expropriation and other forms of control (Beraja et al., 2022). However, China shows a notable situation. Despite its non-democratic governance, the country has experienced a significant increase in innovation in recent years. This situation raises an important question: What factors are responsible for fostering and maintaining high levels of innovation within an authoritarian framework?

[4] For example, Xu (2019) shows that patronage networks in British colonies diminish the motivation of bureaucrats and reduce fiscal capacity. Ru and Zou (2021) find that patronage relationships between local officials and the Chinese Communist Party Central Committee exacerbate the loss of state-owned assets in China. also uncover that patronage connections increase worker mortality rates in China, revealing the societal costs of corruption.

In this study, our findings support the latter view. We investigate the role of PCN in shaping economic outcomes through the lens of innovation at the micro-economic level. We conduct the analysis of politicians' patronage connections in the Chinese context for at least three reasons. First, PCN are deeply rooted in Chinese political culture. Bureaucratic appointments in China are often influenced by informal relationships, and the actual power of politicians largely depends on these informal systems rather than formal rules (Pye, 1995). Recent studies confirm that PCN plays a crucial role in shaping the career trajectories of government officials (Shih et al., 2012). Therefore, it is important to examine the role of PCN in the context of China.

Second, while most research on Chinese politics views these informal relations as systemic flaws (Shih et al., 2012), existing literature suggests that merit-based, Weberian bureaucracies are key institutional prerequisites for successful state-led development (Rauch & Evans, 2000). Contrary to this perspective, our study finds that innovation can occur even in less-than-ideal institutional environments, where interpersonal relationships continue to be an influential aspect of politics. This view aligns with a growing but still fragmented body of literature that argues certain informal or traditional practices can serve as suboptimal arrangements for innovative growth in environments with weak institutionalization.

Third, in a federal system with elected political leaders, such as US., political leaders are produced by elections, states and localities have no hierarchically interdependent relationships with each other (Cole, 2009). Therefore, intergovernmental patronage connections are infrequent, resulting in limited variation in patronage relationships that hinder the identification of their economic impacts.

However, in China, local leaders are political appointees and bureaucrats. Each city[5] government in China falls under the jurisdiction of a superior provincial government. China's hierarchical political system allows for exogenous cross-sectional variation in PCNs among city governments affiliated with superior provincial governments.

Empirically, there are at least two main challenges in identifying the impact of patronage connections between local officials with provincial secretaries and corporates' innovation output. The first challenge is the measurement of PCN: Informal political alignments are inherently concealed and present challenges in direct observation. The second challenge is causal identification. The factors that lead to the formation of networks may also be linked to other distributive priorities. For instance, politicians in significant localities might possess bargaining power that allows them to secure more fiscal transfers from higher levels of government. This power also makes them more valuable political allies to other elites.

To address the first challenge, we employ an innovative approach proposed by Jiang (2018) to deduce patronage relationships from historical promotions. The core concept is to establish connections between junior officials[6] and senior leaders[7] who promoted them to significant city leadership positions (e.g., Mayor or City Secretary[8]). Through a series of validation tests, we have demonstrated that our measurement accurately captures the collaborative dynamics in patron-client relationships and their career trajectories compared to existing alternative solutions.

[5] In this article, we use "city" to refer specifically to prefecture-level cities (including those with a vice-provincial level status). Provincial-level municipalities (zhixiashi) such as Beijing, Shanghai, Chongqing, and Tianjin are not part of our sample.
[6] In this paper, senior official is provincial secretary, who is the de facto leader of a province.
[7] In this paper, junior official is city mayor or city secretary, who is the de facto leader of a city.
[8] In this paper, we use the term "client" to refer to the appointee (i.e., junior officials, mayor and city secretaries) and "patron" to refer to the person (i.e., provincial secretaries, the de facto leader of a province) appointing the appointee.

To tackle the second challenge, we use a distinctive aspect of China's cadre management system: the periodic rotation of high-ranking officials at both provincial and city levels. This generates variations in connectedness between city and provincial governments both across time and space. The reassignment of provincial leaders, in particular, introduces disruptions in the prevailing patron-client networks that can reasonably be considered exogenous to the socioeconomic context at the city level. These variations enable us to estimate the causal influence of personal connections while mitigating potential sources of bias related to leader- and location-specific variations through the incorporation of various fixed effects.

Our results provide evidence that if the leader (i.e., Mayor or City Secretary) of a city has a PCN with the Party Secretary of the province to which the city belongs, firms located in that city will have more innovation outputs. The baseline estimate suggests that, all else equal, firms located in a city with PCNs have on average 7–8% more innovation outputs. The conclusions remain robust after using alternative measures of PCNs, alternative measures of innovation, alternative estimation models, controlling for personal traits of city leaders, and including various fixed effects of city-level leaders and province-year pairs that accounts for heterogeneity associated with specific city leaders and time-varying province-level characteristics[9].

Further analyses reveal that PCN can influence corporate innovation through four possible channels. First, the enhanced trust between higher and lower levels of government. This mutual trust allows clients to conduct policy reforms more ambitiously (Jiang & Zeng, 2020) and promote innovation activities without concerns

[9] We have also considered an alternative explanation, which is, strategic appointments. Clients are strategically appointed to cities with high economic growth. Although this explanation seems plausible for the observed corporate innovation outputs, the empirical results indicate that it is not the primary causal mechanism through which patronage connections influence corporate innovation outputs.

about the potential volatility in local economic performance. Since local leaders are evaluated and promoted based on economic performance and stability, PCN can increase their performance incentives by reducing the risks they face and ensuring their efforts to promote innovation are rewarded.

Second, grounded in the perspective of fostering trust between government tiers, we examine the impact of PCN on local resource allocation. The political science literature suggests that interpersonal relationships wield influence over resource distribution, as evidenced by a tendency among officials to favor members of their own party (Jiang & Zhang, 2020; Lei, 2023). We expect that this phenomenon would extend to patron-client networks, where provincial leaders exhibit a predisposition to allocate a disproportionate share of resources to their clients. Such an allocation strategy not only facilitates officials in securing fiscal and policy support for economic development but also underscores a preference for public investment projects over private ventures for those with established PCN. Our findings reveal that cities with PCNs are more likely to secure provincial special economic zones. Furthermore, firms situated in PCN-cities exhibit markedly elevated levels of government subsidies, alongside lower income and sales tax rates, coupled with an increased access to bank loans.

Third, we find that city leaders with PCNs exhibit greater tolerance for the failure of local state-owned enterprises. Because Local-SOEs are ultimately controlled by the local government, these governments have discretionary power over personnel appointments in these enterprises. Our findings suggest that city leaders with PCNs are more tolerant of failures.

Forth, in China's one-party system, top-down policies often face resistance and inefficiencies due to agency costs, leading to economic policy uncertainty. However, PCN can facilitate better coordination between different levels of government, thereby

stabilizing economic policies and promoting innovation within enterprises. Our study indicates that city leaders with provincial connections are more likely to acknowledge the influence of provincial leadership in their government work reports (GWRs) and maintain more stable economic policies compared to cities without such connections.

We then conduct four further tests to corroborate the main findings. Firstly, we conducted a cross-sectional test on connected patron. We find that the positive relationship between PCN and corporate innovation is stronger when firms located in cities where the patrons are party secretaries rather than governors. Second, we examine whether our documented results are different among central state-owned enterprises (central-SOEs) local state-owned enterprises (local-SOEs), and non-state-owned enterprises (non-SOEs). We find that in comparison with privately owned enterprises and centrally controlled state-owned enterprises, we observe the role of PCN in fostering innovation is more pronounced within local-SOEs. Third, we investigate the impact of PCN on firm innovation across cities with varying institutional environments. Our findings indicate that PCN exerts a more positive influence on firm innovation in cities with weaker market conditions, less effective legal systems, lower levels of openness, and a higher prevalence of Guanxi culture. This empirical evidence suggests that PCN, serving as an informal link among officials, represent a powerful complement to the lack of formal institutional systems. Finally, we show that PCNs enhance corporate innovation efficiency and is associated with a firm's emphasis on innovation and innovative talents.

Our research makes several important contributions. First, our results show that PCN can effectively generate incentives among local governmental leaders to promote innovation within the largest developing country globally. Our study thus adds to the body of literature exploring the association between the organizational characteristics

of governments and economic performance, which commonly suggests that effective governance requires the presence of strong, well-functioning political and bureaucratic institutions. For example, the literature on developmental states posits that performance-based Weberian bureaucratic institutions are crucial institutional prerequisites for successful state-led development (Rauch, 1995; Rauch & Evans, 2000; Weber, 1968). Our results present a different perspective that, even within an imperfect institutional environment, personal and political relationships serve as an informal institution and suboptimal arrangement to incentivize economic development in emerging markets with relatively weak institutions. Our evidence in the context of China, one of the largest developing countries, adds to the growing body of literature that documents the positive impacts of PCN with a focus of South American countries (Chilcote, 1995), African "hereditary developmental states" (Khan, 2000), and theoretical modeling (Dewan & Squintani, 2016).

Second, to our knowledge, this study is among the first that examine the impact of PCNs on economic outcomes at the micro-economic level. The evidence from the political science literature suggests that PCNs may either encourage or weaken the incentives of lower-level officials for governance, thereby impacting local governance performance (Colonnelli et al., 2020; Jiang, 2018; Oliveros, 2021). From the economics perspective, the innovation performance of corporations, as micro-level integral components of local economies, represent the governance outcomes of local governments and contribute to local economic development. Our results present novel evidence that firms located in cities with PCNs exhibit higher levels of innovation outputs, as PCNs leads to favoritism in resource allocation, facilitate policy coordination, mitigate myopic behaviors of local leaders and alleviate the uncertainty faced by both local leaders and corporate managers. Thus, our firm-level evidence

provides important insights into the underlying mechanisms through which PCNs influence micro-economic activities and outcomes and thus impact economic performance at the aggregated level.[10]

Finally, our study adds to the strand of literature linking corporate innovation outputs with political landscape. For example, corporate innovation outputs increase with anti-corruption (L. Fang et al., 2023), lobbying (Kang, 2015), PAC donations and political activism (Ovtchinnikov et al., 2020), and firms' political connection (Akcigit et al., 2023), but decrease with corruption (Huang & Yuan, 2021), political uncertainty (Bhattacharya et al., 2017). Our study adds to this literature by highlighting that PCNs act as an informal institution and is an important attribute of politicians' social networks that can lead to innovation-led growth.

The rest of this paper is structured as follows. In Section 2, we review relevant literature, describe the institutional background of PCN in China and propose our hypothesis. Section 3 presents the sample, variable measurement and summary statistics. Section 4 shows the empirical analyses and results. Section 5 presents possible mechanisms. Section 6 present some cross-sectional tests. Section 7 concludes.

[10] The primary literature relevant to our study is Guo et al., (2022), in which they found that firms located in connected prefectures, where city leaders have school ties with their provincial superiors, tend to make more investments. In contrast, we did not select alumni relationships as a proxy variable for PCNs, but instead utilized metrics based on promotion and appointment. This is because overlapping experiences cannot fully reflect the quality of relationships. Individuals who share common experiences in the past may have been friends or competitors, and these experiences may not necessarily coincide temporally. This would result in significant endogeneity issues. However, our measurement identifies PCNs by connecting lower-level officials with the provincial leaders who were in office when those officials were initially promoted to key city leadership positions. Furthermore, we go a step further than Guo et al. (2022) by investigating corporate innovation. Firms' investments may indicate either overinvestment or underinvestment, whereas innovation can reflect the actual quality of investments.

2. Literature review and hypothesis development

2.1 Literature review

Historically, patronage has served as a pivotal mechanism in politics within premodern political regimes such as tribes, monarchies, and empires (Hoffman, 2017). Informal, personalized relationships—often variously referred to as factions, cliques, or patronage networks (PCN)—are prevalent in dominant parties within both democratic and authoritarian contexts (Geddes, 1994; Grindle, 1977).

Most existing literature have documented the negative economic consequences of PCN and suggest that effective governance needs strong, well-functioning political and bureaucratic institutions (Shih et al., 2012). In the field of political science, the informal relationships established through PCNs are found to represent more corrupt and dysfunctional aspects of national systems and posing a threat to the proper functioning of elite institutions; accordingly, PCN is found to be associated with reduced efforts of bureaucrats (Xu, 2018), vote buying (Stokes, 2005), undermining formal accountability mechanisms (Stokes, 2005), and distorting political incentives (Geddes, 1994). At the macroeconomic level, existing studies often relate PCNs to poor economic performance of developing countries (Goldsmith, 1999; Zon, 2001), and find that PCN tends to foster corruption (Chu et al., 2021; Moon & Schoenherr, 2022), reduce fiscal revenues (Xu, 2019), distorting regional resource allocation (Jiang & Zhang, 2020), and consequently hinder economic development (Goldsmith, 1999). However, evidence at the microeconomic level is scarce. Prendergast and Topel (1996) show that favoritism from patrons suppresses client officials' incentive, resulting in poor economic performance. Ru and Zou (2021) find that PCN incentivizes local officials to sell the shares of state-owned enterprise to corrupt parties, thereby exacerbating corruption in the privatization process.

In contrast to the negative perspective of PCNs, several studies present evidence on the benefits brought by PCNs as a useful supplement to formal institutions (Jia et al., 2015). For example, the political science literature suggests that PCN represents a positive signal between hierarchies that the clients have been invited into the "coalition" of politicians (Bueno de Mesquita et al., 2003). Accordingly, the establishment of PCN alleviates the asymmetry of information among lower and senior officials, enhances government responsiveness (Jiang & Zeng, 2020), facilitates the selection of more capable bureaucrats (Voth, 2020), and ultimately improves bureaucratic performance (Toral, 2023).

Similar results are also documented in the economics literature. At the macroeconomic level, (Schneider, 1991) find that Brazil's PCNs facilitate rapid industrial development in the country during the 1970s and 1980s by promoting coordination among various governmental institutions. In African countries, Khan (2000) show that even under hereditary political structures with PCNs, rapid economic growth is possible when the leadership is committed to promoting economic development. At the microeconomic level, is relatively limited. Acemoglu et al. (2012) argued that patrons possess better private information to assess and select client officials who will perform better. Voth (2020) demonstrate that naval officers promoted by patrons perform better, as their patrons acquire better personal knowledge through family connections. Together, the existing literature presents mixed evidence on the role of PCNs in both political science and economics spaces; however, at the micro-economic level, it remains unclear whether the presence of PCNs among bureaucracies would foster or imped local economic activities such as corporate innovations that would eventually translate into local economic development.

2.2 PCN in China

The practice of PCN in China has a long-established history rooted in Chinese political culture. It dates back to Imperial times, further extends into the Republican era (Bergèere, 1980), and strengthens since the advent of the CCP and the establishment of a powerful, all-encompassing state (Jiang, 2017). In China's political system, which forbidden open competition, informal networks serve as crucial mechanisms for elites to pursue interests and organize collective actions (Dittmer, 1978). The patron-client relationships, known as "lines" (xian), involve mutual obligations. Clients demonstrate responsiveness to patrons' interests, while patrons offer career advancement and protection. These informal alliances often prove more enduring and significant than formal bureaucratic relationships [11](Jiang, 2018).

Most research in elite politics within the context of China has provided empirical evidence highlighting the significance of PCN, serving as the predominant channels through which political leaders wield their power and exert influence. The hierarchical structure within the Chinese bureaucracy is often characterized as highly personalized, driven not by formal regulations but by an intricate web of interpersonal connections that spans from the top leaders to their clients (Pye, 1995) . A politician's effective political influence is significantly shaped by the extent and robustness of their informal patronage network (Dittmer, 1978).

Under Xi Jinping's leadership, Li Qiang, a loyal client of Xi, currently serves as Premier of the People's Republic of China (PRC). During Xi's tenure as Secretary of Zhejiang province, Li Qiang held significant roles such as Secretary of Wenzhou City and Secretary-General of the Zhejiang Provincial Committee. He is recognized as a key

[11] From Jiang (2018), Personal interviews, GX1403, SH1502, SX1603, ZJ1501, ZJ1601.

architect and proponent of governmental reforms in Zhejiang. Notably, under his leadership, the Zhejiang e-Government Service Network was established, setting a national precedent for "Internet Plus Government Services. [12] " Li Qiang also championed reforms in the administrative approval system and the streamlining of government functions.[13] The above-mentioned examples indicate that CCP elites have use PCNs as a vital mechanism to achieve various political and economic goals. According to the discussion of the contrasting view of the PCN role, its impact on societal welfare and economic development varies and is conditional on the characteristics of the PCN such as the patron's objectives and preferences, which could lead to either favorable or adverse outcomes.

2.3 PCN and corporate innovation

In China, officials are selected through an appointment system. Local Chinese leaders are political appointees and bureaucrats, chosen by their superiors and governed by bureaucratic rules. This contrasts with the electoral systems in democratic countries.

While China asserts a merit-based system for the recruitment and appointment of bureaucrats, it is crucial to highlight that the Chinese bureaucracy lacks a consistent policy directly correlating tenure success with political advancements (Su et al., 2012)[14]. Decision-makers at higher levels often possess significant discretion in interpreting and utilizing evaluation results during the promotion process (Heberer & Trappel, 2013), resulting in heightened uncertainty surrounding the prospects of promotion for agents.

[12] Caixin Online, "Li Keqiang on Zhejiang Reform". Source: https://china.caixin.com/m/2015-01-14/101162659.html

[13] Another example is Xu Lin, a client of Xi Jinping, is the Secretary of Guizhou Province and a member of the 19th and 20th Central Committees of CCP. He successfully implemented poverty alleviation policies, lifting 9.23 million people out of poverty and removing labels from 66 counties. Additionally, he advanced the digital economy and big data initiatives, establishing Guizhou as a national hub for computing power.

[14] The official guidelines provided by the Central Organization Department prioritize five key criteria: moral integrity (De), competence (Neng), diligence (Qin), achievements (Ji), and honesty (Lian).

A substantial body of literature has contended that within authoritarian regimes, leaders frequently confront a dilemma between loyalty and competence in political appointments (Egorov & Sonin, 2011). Consequently, a principal may hesitate to elevate highly competent agents if there exists a fear that they may pose a future challenge to the principal's authority, potentially discouraging agents from exerting optimal levels of effort from the outset. The existence of personal connections between principals and agents partially alleviates the commitment issue. This is proved by Jia et al. (2015), who argue that patronage ties can enhance the willingness of senior leaders to endorse capable candidates by bolstering their confidence in the loyalty of those they promote. Furthermore, if a patron consistently fails to reward diligent followers without a valid reason, they risk acquiring a reputation for disloyalty, which could severely impede their capacity to attract and retain clients in the future. Therefore, in alignment with extant literature (Jiang, 2018; Jiang & Zhang, 2020; Toral, 2023; Voth, 2020), we contend that PCN serves as implicit assurances for clients, ensuring that they make decisions during their tenure that are conducive to the sustained growth of the region. This implicit assurance also fosters a level of trust across among government hierarchies. We will further explain how the above two points work in the section on indicator construction in Section 3.4.

Given trust building among government hierarchies via the PCN, we argue that PCN can foster corporate innovation through at least three plausible mechanisms.

The first mechanism relates to favorable resource allocation due to the PCN. Political economy literature suggests that patron-client connections help clients obtain more resources from their patrons (Arriola, 2009; Hollibaugh Jr. et al., 2014; Jiang, 2018; Jiang & Mei, 2020; Jiang & Zhang, 2020). Thus, compared to officials who lack PCNs, clients will find it easier to secure financial and policy support from political

sponsors through their PCN to foster the development of their jurisdiction[15]. The increases in resource allocation from higher-level government authorities, such as the establishment of provincial-level special economic zones and the provision of generous tax incentives and fiscal transfers, has had a significant impact[16]. In light of the political tournament incentives in China, as discussed by Li and Zhou (2005), governments, to the extent of their authority, are inclined to offer companies convenient support, enabling them to excel in tournaments at the same administrative level (Li et al., 2008; Li & Zhou, 2005). Consequently, cities that secure more resources are more likely to allocate these resources into firms, thereby increasing innovation outputs.

The second mechanism is that PCN increases the failure tolerance of local officials. In China, the path from city leader to national leader typically involves five steps and takes approximately 15 years[17]. If city leaders do not achieve the next level before reaching the age limit, they retire[18]. Restricted to these established rules, officials often need to shorten each tenure and perform better within these shorter tenures (Kou & Tsai, 2014) [19]. Given that innovation takes time to yield benefits while city leaders frequently change positions, they generally do not approve high-risk, long-term projects like innovation. Previous research has found that officials who are with strong political motives and short horizons often engage in short-term actions at the expense of long-

[15] Additionally, due to the relatively lower costs associated with obtaining policy and financial support from higher-level authorities, alternative options for mobilizing local resources to foster innovation may appear less attractive to officials who find it easier to secure support from their superiors.
[16] Between 2006 and 2010, Dongguan (a client city belongs to Guangdong Province) invested 5 billion Yuan, or 1.8% of its fiscal budget, in the Technology Dongguan program to drive innovation. This program supported technology upgrades, credit for small and medium-sized enterprises, government-funded projects, and innovation services. Dongguan also developed the Songshan Lake Science and Technology Industrial Park (DGSSL) in previously remote areas, investing heavily in infrastructure, including a new highway. Opened in 2010, DGSSL has attracted over 800 IT firms, 400 robotics companies, and 300 biotech firms by 2019, and filed 4,869 patents.
[17] Source: https://www.gov.cn/xinwen/2020-03/15/content_5491492.htm.
[18] Source:https://www.taylorfrancis.com/chapters/mono/10.4324/9781315700151-14/notice-revision-job-title-list-cadres-managed-central-committee-john-burns.
[19] Kou and Tsai (2014) interpret fast promotion as a choice made to balance stability and rejuvenation.

term development, such as neglecting environmental protection (Greenstone et al., 2022), engaging in political window dressing (H. Fang et al., 2023), influencing city planning and land development (Wang et al., 2020), and thus suppressing innovative activities.

However, with the trust built among government hierarchies via the PCN, patrons provide credible information about the political environment and offer extra-institutional protection to client, especially when local economic performance is unfavorable (Qingjie & Yujeong, 2017). Additionally, when client officials strive to some implement ambitious development plans through firms they govern, they often find themselves compelled to circumvent cumbersome restrictions and may have to engage in activities beyond official boundaries (Ang, 2016). Such activities can be critical when a client official is being considered for promotion, as competitors may report these behaviors to higher level officials. Patrons can effectively prevent investigations into their clients regarding such reports and alleviate the client's responsibilities (Lorentzen & Lu, 2016). For example, during anti-corruption campaigns, the PCN provides extra protection for their clients (Lorentzen & Lu, 2016).

In this respect, we propose that the PCN increases clients' tolerance for firm failures. Manso (2011) shows that failure tolerance is essential in motivating innovation. The implementation of policy objectives largely depends on the actions of microeconomic entities. In this context, the increased tolerance for failure under PCNs means that when a company performs poorly, clients who are not short-sighted are less likely to dismiss the CEO in pursuit of short-term economic gains. This tolerance is reflected in the principal's decision on the termination threshold for a project. A principal who tolerates failure would set a lower threshold than the ex post optimal level, thereby encouraging innovation from the agent. Conversely, a principal who does

not tolerate failure would set a higher threshold, discouraging innovation. The positive impact of failure tolerance on innovation is also well-documented in the literature.

The third mechanism aims to mitigate the uncertainty through the mutual trust established by PCN, which involves reducing policy uncertainty and alleviating firms' uncertainty perception.

In traditional hierarchically structured systems, top-down transmission of policy often results in agency costs (Rudolph & Rudolph, 1979). Agents, seeking to maximize their own political interests, may prolong, distort, or even subvert the policies of their superiors (Stokes, 2005)[20], posing significant challenges to the dissemination and implementation of policies, leading to policy turbulence and uncertainty. However, informal connections provide partial remedies for this issue through ongoing interest exchange and interconnected career pathways (Rudolph & Rudolph, 1979).[21] In these situations, clients with PCNs to the provincial secretary tend to invest more effort and resources in supporting their patrons' professional activities. This vested interest in the client's long-term career success helps build client loyalty (Jiang, 2018). Such connections can facilitate smoother policy communication, thereby reducing economic uncertainty in the city.

Traditional real options (Bernanke, 1983) and various theoretical models (e.g., Bloom (2007)) demonstrate that when investment projects are not fully reversible, firms perceived uncertainty tend to exercise caution and delay investment under uncertainty, as this increases the value of the option to wait (Bloom, 2007). The option to wait is

[20]During the 2004 inflation campaign, provincial secretaries allied with Hu Jintao and Wen Jiabao administration responded enthusiastically, while those linked to the previous general secretary were less cooperative and occasionally resisted. This highlights the coordination role of PCN.

[21] For instance, Grindle (1997) documents that the PCN within Mexico's ruling party, the Institutional Revolutionary Party, between 1929 and 2000, facilitated political mobilization for supporting policy changes and engaging in crucial governmental activities.

especially critical for R&D investments, given that innovation involves exploring unknown approaches and untested methods (Ferreira et al., 2012), which require substantial investment in intangible assets. This option becomes even more crucial in politically uncertain environments because the success of innovative endeavors often depends on the prevailing government. Numerous existing studies indicate that policy uncertainty significantly affects firm behavior and reduces innovation[22]. In all, we argue that PCN mitigates policy uncertainty, and thereby promotes corporate innovation.

Therefore, based on the aforementioned, we posit the following hypotheses:

Hypothesis: All else being equal, firms in cities where city leaders have PCNs with provincial secretaries are associated with more innovative outcomes.

[22] Bhattacharya et al., (2017) found a significant reduction in innovation due to policy uncertainty. Julio et al., (2012) revealed that political uncertainty notably decreased firms' investment and capital expenditure, consequently reducing innovation output. Criscuolo et al., (2015) demonstrated that long-term stable environmental policies are more effective in promoting firms' long-term development.

3. Data and research design

3.1 Empirical design and sample selection

Based on the outcome of a previous study on corporate innovation (Acharya et al., 2013; Beraja et al., 2023; Nanda & Rhodes-Kropf, 2013; Tian & Xu, 2021), to explore the impact of PCN on corporate innovation, we construct the following model:

$$Patent/Citation_{i,t+2} = \alpha_0 + \beta_1 Connect\ to\ Sec + \sum_{t=1}^{n} \gamma_i\ Control_{i,t} + Year_t + Firm_i + \varepsilon_{i,t} \quad , \tag{1}$$

where i and t index the firm and city respectively. The definition of *Patent*, *Citation* and $Connect\ to\ Sec$ will be illustrated in 3.2 and 3.3. *Control* represents control variables. Following previous studies (Ayyagari et al., 2011; Cornaggia et al., 2015; Jiang et al., 2020; Lerner & Seru, 2021), we consider the following control variables: firm age (*AGE*), firm leverage (*LEV*), firm size (*SIZE*), the number of independent directors (*OUTDRATE*), firm growth (*GROWTH*), Tobin's Q (*TOBINQ*), cash holdings (*CASHFLOW*), return on assets (*ROA*), the largest shareholder ownership (*TOP1*), managerial ownership (*MSHRATE*), and book-to-market ratios (*MTOB*). Additionally, *Year* represents year fixed effects and *Firm* represents firm fixed effects. ε represents the random error term. Table A.1 presents the specific definition of each variable.

Our empirical analysis starts with a sample of publicly listed Chinese firms over 2000-2015. Our sample ends in 2015 due to the public availability of official data and prior professional experiences, and a substantial portion of officials' biographical details have become less available since then. We obtain financial data from CSMAR. City level data such as population, GDP, etc. are sourced from the China Statistical Yearbook. Furthermore, we exclude observation with missing value. Our final sample consists of 20,225 firm-year observations.

3.2 Corporate innovation

We measure a company's innovation output by assessing its patenting activity, which offers a more comprehensive measure of innovation compared to R&D expenditures.[23] We collect patent from the State Intellectual Property Office (SIPO) of China. This dataset provides China's patent information since 1985, detailing a patent's type, application year, grant year, and the applicant's address. Based on the information from SIPO, we construct two measures for a company-year's innovation output. The first measure is a company's number of patent applications filed in a year that are eventually granted[24]. To more comprehensively evaluate the impact of a patent, we have developed a second measure of a company's innovation output. This measure involves quantifying the number of citations received by the company's patents, while excluding self-citations in subsequent years. In this way, the quantity of patents represents the scale of innovation output, whereas the number of citations signifies the significance and quality of that innovation output, which are consistent with prevailing literature on corporate innovation (Agarwal et al., 2017; Cornaggia et al., 2015; Shu et al., 2022; Tian & Xu, 2021). Both the quantification of patent quantity and the assessment of citations per patent are subject to truncation biases (Lerner & Seru, 2021).

Moreover, following Tian and Xu (2021) and Hall et al. (2001), we adjust for the bias in application (citations) by dividing the application (citation) count by the mean citation count for the grant-year cohort to which the patent belongs. We compute our

[23] Patenting activity serves as a metric for the results of the innovation process, encompassing the cumulative impact of all innovation inputs, including R&D investments, human capital, and other intangible assets. In contrast, R&D solely represents the quantity of one input in the innovation process and fails to discriminate between innovations of varying quality.

[24] We use a patent's application year, instead of the grant year, to better capture the actual timing of the innovation.

main innovation measures from truncation-adjusted patent counts and citations per patent[25].

3.3 Patron–client relations

The prevailing method to measure informal connections within authoritarian regimes typically relies on shared work or educational experiences, as well as common hometowns between two individuals. While these shared experiences are undoubtedly a vital foundation for establishing personal ties, they may not reveal the true nature or depth of the relationship. It is possible that individuals who have previously worked together may, in fact, be competitors rather than friends. Furthermore, applying this overlap-based approach at the subnational level encounters practical hurdles, as provincial patrons are typically assigned from outside the province and therefore have few pre-existing connections with lower-level officials, who often spend the majority of their careers within the province.

To address these challenges, we leverage the distinctive institutional features of the personnel appointment system to introduce an alternative measure. Our approach identifies patron-client relations by linking lower-level officials with provincial leaders who held office when these officials were initially promoted to key city leadership positions. More specifically, we define a city leader (referred to as CL) as a client of a provincial leader (referred to as PL) if and only if the following condition is met:

[25] The truncation bias in patent numbers becomes evident towards the end of the observation period, as there is typically an average delay of two to three years between the initial patent application and the actual granting of the patent. Consequently, our dataset may include patent applications that are still under review in later years. Additionally, the measure of citations per patent is affected by truncation, as patents granted in later years inherently have fewer years available to accumulate citations. Following approaches introduced by Hall (2005) and, we address the issue of truncation biases of patent quantity by scaling each patent with weights derived from the observed distribution of application-to-grant lag times. We also conduct a set of additional robustness tests based on the approaches proposed by existing prevailing literature (Demirguc-Kunt 2010; Aghion et al. 2013; Brown et al. 2013; Cornaggia et al. 2015; Tian & Xu 2021; Beraja et al. 2022; Shu et al. 2022), in order to o ensure that truncation biases do not drive our results.

CL was first promoted to a prefecture-level city leadership position (such as city secretary or mayor) from within the province during PL's tenure as the provincial secretary.

Our empirical centers on examining the intricate dynamics between provincial and city levels. Our primary focus is on the provincial party secretary, the key political leader who serves as both the head of the provincial party organization and the de facto leader of the province. The provincial party secretary wields substantial authority over major political, policy, and economic decisions within their province. This authority extends to the allocation of fiscal resources, including transfers.[26]

For our prospective clients, our focus is on city party secretaries and mayors, who are prominent local leaders in city-level governments. City leaders receive resources from provincial governments to fund various policy programs in areas such as social welfare, public health, education, and infrastructure development. Although provincial governments are theoretically expected to allocate fiscal resources equally to all cities, the actual relationship between cities and provinces often hinges on the quality of personal relationships between individual leaders. As we will delve into more extensively below, provincial secretaries play a pivotal role in the appointment of city leaders and typically maintain closer personal connections with the city leaders they have appointed than with those selected by their predecessors.

We provide several illustrative examples of the construction of our PCN measure in Table 1. The two examples we illustrate are Li Qiang and Wu Tianjun, who are both city-level officials in the province. Our PCN measure is equal to one for Wenzhou

[26] Provincial influence extends to both budgetary decisions in standing committee meetings and the allocation process. Provincial secretaries can decide on the placement of programs and adjust transfer formulas. Even with central grants, provincial governments act as gatekeepers (Hillman 2014), allowing them to filter applications. They may also need to provide matching funds ('caizheng peitao zijin') and oversee budget distribution, giving them discretion in grant allocation.

between 2002 and 2004. This is because Li Qiang was firstly promoted to his first city leadership (i.e., CL) in 2002, when Xi Jinping was the incumbent provincial secretary (i.e., PL). The established PCN ends in 2004 as Li Qiang was appointed as a provincial leader as the secretary-general of Zhejiang Province since 2005 and was no longer connected to Xi Jinping.[27] [28]

[Insert Table 1 here]

Our PCN measure implicitly assume that the established PCN remains unchanged as long as there is no change for either the city leaders or the provincial leaders. In other words, any turnover at either the city or provincial levels would remove the PCN network for the corresponding city unless the provincial leader designates a new city leader to maintain the PCN network or replace a previously unaffiliated one. Figure 1 and Figure 2 depict the dynamics of the PCN in specific provinces, showcasing the patterns and significant variations in PCN over time within Shandong and Guangdong provinces.[29] [30]

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[27] For Li Qiang, he spent most of his time in functional department until 2001 and as the party secretary of Wenzhou City between 2002 and 2004. His promotion to his first city leadership post thus occurred in 2002. Following our measure, we then go back to the provincial leaders' biographies and try to find out who was the incumbent provincial secretary in 2002. It turns that it was Xi Jinping, who is now the Chairman of PRC. Our measure thus identifies Li Qiang as a connected mayor (and the city he serves as a connected city) between 2002 (C s first year as city leader) and 2004 (Li Ke's promotion to Provincial-level department)..

[28] Similarly, for Wu Tianjun, our measure focuses on identifying the promotion to first city leadership posts, which is the 2001 promotion to city party secretary. Turning to provincial leaders' biographies, we can see that Chen Kuiyuan was the provincial party secretary in 2001. We therefore code Wu Tianjun as a client of Xinxiang and the city that Wu Tianjun serves will be considered as a connected city between 2001 (when C2 first becomes city party secretary) and 2002 (Wu's patron's Chen Kuiyuan retirement).

[29] In 2007, Shandong province experienced significant political changes under Zhang Gaoli, who had been governing since 2003. By this time, Zhang had built a strong network across the province, with his loyal clients in key leadership positions in most cities (Figure 1, marked in blue). In 2009, a leadership transition occurred when Jiang Yikang succeeded Zhang as party secretary (Figure 1, marked in green). Initially, none of the prefecture-level cities had connections with Jiang. However, by 2015, the number of interconnected cities increased, leaving only two cities unaffiliated.

[30] A similar pattern emerged in Guangdong province (Figure 2). In early 2007, Zhang Dejiang, who had been in office since 2002, had established a network by placing his clients in significant leadership roles (Figure 2, marked in blue). A major leadership change occurred in 2008 when Wang Yang succeeded Zhang (Figure 2, marked in green). By the end of 2008, only a few cities had reestablished their network ties. During Wang's term, interconnected cities steadily increased, reaching 19 by the end of 2012. In late 2012, Hu Chunhua took over as provincial leader (Figure 2, marked in yellow), leading to a major

3.4 Validating the Measure of PCN

In this section, we present several validation tests for the connection-based measure of affiliation. These validation tests are prompted by the following observation: within hierarchical organizations, individuals linked through informal relationships tend to display more pronounced synchronous career trajectories. If our measure accurately captures the underlying long-term personal affiliations, we should anticipate a significant correlation between the career outcomes of patrons and their clients. When a patron is promoted to a higher-level position, junior officials with strong personal ties to them are also more inclined to ascend in their career trajectories.[31] Conversely, if the senior mentor's career experiences setbacks, it is likely to have a detrimental impact on the career prospects of their followers.

We commence our analysis by assessing the predictive power of this measure concerning the likelihood of an official's promotion, contingent upon the advancement of their patron to a more influential position.[32] The dependent variable in this analysis is represented by a binary indicator, which signifies whether a municipal leader secures a promotion to a higher-ranking position, typically at the deputy-provincial level, within the party or government during a given year. Subsequent to the occurrence of the initial promotion, all person-year observations are excluded from our analysis. The following logistic regression model is then estimated:

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restructuring of political factions and relationships, significantly transforming the political landscape.

[31] From the examples illustrated in Table 1, we observe that Li Qiang rapidly ascended to the position of Vice Secretary of Zhejiang Province in 2007, coinciding with the elevation of his patron, Xi Jinping, to the standing of a member of the Central Political Bureau of the Communist Party of China.

[32] To carry out this evaluation, we obtain the city secretary name list, provincial secretary name list and the politicians' biographical information from CSMAR, CNRDS (Chinese Research Data Services Platform) and CCER Officials Dataset from Peking University (Yang et al., 2022) . We cross-validate and manually search Baidu Encyclopedia, Bing and Google for each politician's curriculum vita (CV). In this study, we focus on the patronage connections of city secretary, and all profile datasets cover all city leaders of the CPC. Each CV records the politician's gender, age, educational history, place of birth, and work history. It is common for people to have the same name in China, so we double-check the politicians who share a name and give them unique IDs.

$$h_i^{Promotion}(t) = \quad logit(\, Patron\ to\ Politburo\ or\ PSC_{i,t} + q(t) + q(\gamma) + X_{it}\beta), \tag{2}$$

where i indexes the subject. We include natural cubic splines for both calendar year, q(γ), and the number of years since the person first served as a city leader, q(t), to account for temporal dependence in the outcome (Beck et al., 1998). The key independent variable, Patron to Politburo or PSC, is an indicator that takes a value of 1 if the subject has any political patron who is currently a sitting member of the Politburo and its Standing Committee (and equals to 0 otherwise). We also use a similar design to look at negative career outcomes, with the following specification:

$$h_i^{Investigated}(t) = \quad logit(\, Patron\ to\ Politburo_{i,t} + Patron\ to\ PSC_{i,t} + \tau Investigated_{\,i,t} + q(t) + q(\gamma) + X_{it}\beta), \tag{3}$$

The only two differences are: (1) we distinguish between connections with (regular) Politburo members versus Standing Committee members, as the latter usually have much greater influence on sensitive issues such as anticorruption investigations, and (2) we include a variable that indicates whether an official's patrons have been investigated for corruption. While having a patron sitting at the top may reduce the risk of investigation, having a patron who is himself a target of investigation may increase such risk.

Column (1) and Column (2) of Table 2 presents the promotion results. We can see that our measure uncovers a strong correlation between the client's and patron's positive career outcomes: An official's promotion odds increase by about 86.64% ($e^{0.624} - 1$) after the putative patron moves into high-level decision-making bodies such as the Politburo. Column (3) and Column (4) of Table 2 presents the regression results on the demotion outcomes. Here, we see that our measure again uncovers a strong career association between patrons and clients: According to the results in Column (3) and Column (4), when a patron moves to the PSC, the odds of his/her client being

investigated drops by about 22.2% ($1 - e^{-0.081}$); when a patron becomes the anticorruption target, the odds of his/her client facing a subsequent investigation more than 5 times ($e^{1.606}$).

[Insert Table 2 here]

In order to comprehensively understand the dynamics of this informal performance contracts, we further offer additional insights into the behaviors of political superiors. If performance incentives are shaped by formal institutional mechanisms, we would anticipate observing a consistent link between performance and political rewards. To test this, we construct a sequence of observations commencing from the year of an official's initial appointment to a municipal panel and extending through 2011, unless one of the following conditions is met: (1) the official is promoted, defined as a transition from a prefecture-level position to a vice-provincial level or higher role within the party or government, or (2) the official retires, passes away, or faces disciplinary sanctions.

The key independent variables of interest are the Cumulative Relative Performance (*CRP*), which represents the average relative growth in innovation outputs at the city-level achieved by an official during their tenure as a city secretary or mayor in previous positions. Essentially, it quantifies the extent to which a city official has consistently outperformed the provincial average up to the present point. In our empirical analyses, we introduce a refinement to the aforementioned formula by distinguishing between two types of CRPs: CRP for a patron and CRP for a non-patron. The former signifies cumulative performance achieved under a provincial secretary who endorsed the official's career advancement, while the latter represents performance under a non-patron provincial secretary. In our person-year dataset, CRPs are continually updated during the official's tenure in city leadership roles, as they deliver

new performance data annually. Once an official steps down from city leadership positions, the CRP values remain constant for the remainder of their observations. This measurement methodology offers several advantages. Firstly, when making promotions, superiors are likely to consider an official's entire career track record up to that point, rather than focusing solely on the present moment. Exceptional performance in one year, balanced by poor results in another, is likely to be taken into account. Secondly, the utilization of growth statistics within regional units allows for comparisons among officials with diverse backgrounds. It serves as a valuable and informative signal that continues to influence an official's career trajectory. Even if officials are not immediately promoted after their tenure as city leaders, their performance in cities, which discloses insights into their competence and loyalty, is likely to be remembered and affect future promotion decisions.

In our analysis, we estimate the following hazard model:

$$h_{ig}^{Outcome}(t) = \begin{array}{c} h_{0g}(t)exp(\beta_1\, CRP\ under\ Patron_{i,t} \\ +\beta_2 CRP\ under\ non-Patron + X_{it}\beta), \end{array} \quad (4)$$

where i and g index the individual and the risk strata, respectively. In all models, we stratify on two variables: (1) whether the subject was a city secretary or a mayor and (2) the province in which the subject works, both at the beginning of all his/her observations to account for the heterogeneity in the underlying hazard. We estimate the effect of CRPs separately for two key outcomes of interests: promotion and disciplinary sanction.

Table 3 presents the results on the differential effects of performance. In Column (1), we find that cumulative performance delivered under the patron is strongly correlated with one's promotion. One standard deviation increases from the provincial average, for example, raises the odds of promotion by about 36.34% ($e^{-0.081}$). By contrast, performance under a non-patron appears to have little effect on growth.

Columns (2) report the results from using disciplinary sanction as the dependent variable. The results are remarkably similar to that of the promotion analyses: Only better performance under a patron is strongly associated with political rewards (in this case, lower risk of investigation).

[Insert Table 3 here]

These results provide strong empirical support for the validity of the promotion-based measure and demonstrate that it is a more appropriate measure than the conventional overlap-based one in the context of this study.

4. Empirical analysis

4.1 Descriptive statistics

Table 4 shows the summary statistics. In our sample, 62% of firm-year observations are connected to the provincial secretary. The mean values for the patent variables, *LN(PATENT)* and *LN(CITATION)*, are 1.006 and 1.848, respectively. This indicates that, on average, a firm holds approximately 1.734 patents and receives 5.347 patent citations. The descriptive statistics for the control variables align with those reported in previous studies.

[Insert Table 4 here]

4.2 Baseline results

Table 5 presents the baseline results on the effects of PCN on corporate innovation applications and patent citations. The results confirm the important influence of PCN on innovation. In Column (1), the dependent variable is the patent application quantity variable, *LN(PATENT)*. The coefficient estimates on $Connect\ to\ Sec$ is positive and significant at the 1% level. The economic effect is sizable: the magnitude of the coefficient estimate in Column (1) suggests that the number of patent applications of a connected city increases by 8.7% more than that of an unconnected city. In Column (3) and Column (4), we replace the dependent variable with patent quality variable, quantity of citations of patent in the future years, *LN(CITATION)*. The coefficient on $Connect\ to\ Sec$ in Columns (3) and (4) are both positive and significant at the 1% level. The magnitudes of the coefficient estimates suggest that a connected city exhibits 7.9% larger increase in the number of patent citations, compared with those of the cities without patronage connections.

[Insert Table 5 here]

4.3 Excluding alternative explanations: Strategic Appointments

It is possible, for example, that connected city leaders are strategically appointed to cities that historically tended to receive more top-down funding.

In our previous discussion, we have found that there is a positive correlation between PCN and firms' innovation outputs. However, a concern arises regarding the potential influence of a leader's network on their appointment to regions with higher economic development levels, which naturally exhibit more corporate innovation. Alternatively, it is conceivable that leaders with extensive connections are strategically placed in regions with a historical propensity to receive greater top-down funding. To address this concern, we conducted three different tests to mitigate the possibilities of strategic appointments.

First, we examine whether the parallel trends assumption is satisfied using the following regression model:

$$Patent/Citation_{i,t+2} = \alpha_0 + \sum_{\tau\leq -3}^{\tau\geq 3} \delta_i \, Connect\ to\ SEC_{i,t} + \sum_{t=1}^{n} \gamma_i \, Control_{i,t} + Year_t + Firm_i + \varepsilon_{i,t}), \quad (5)$$

where $\sum_{t\leq -3}^{t\geq 3} \delta_i \, Connect\ to\ SEC_{i,t}$ is a set of binary indicators for whether city i is connected to the provincial secretary at time $\tau + t$. The whole set of dummies encompasses connection statuses ranging from 3 years before forming a connection to 3 years after losing one. If our findings were solely influenced by pre-existing disparities, we would anticipate noticeable differences in the corporate innovations between connected and unconnected cities before the appointment of client city leaders. However, Figure 3-1 and Figure 3-2 do not support this hypothesis. This provides strong evidence that cities with PCNs do not show significant differences in corporate innovation compared to other cities before the connection period.

[Insert Figure 3-1 and Figure 3-2 here]

Secondly, we separately estimate the effects of connections established through different channels. In the promotion system of Chinese officials, there are two strategies by which the patrons can promote their clients to specific positions: (1) The first approach is to wait until the current official retires or their term ends before allowing the official's clients to assume the office. This way is minimally politically controversial, but the choice of where to appoint is limited by the vacancy; (2) The second way is that the provincial secretary could break out of the term expiration and retirement age to take control of these cities before their own tenure expires. The latter is highly endogenous. This is because provincial secretaries seeking political control, in addition to appointing their own clients to targeted position, may implement unobservable preferential policies that are likely to affect local social and economic conditions, and thereby influencing the level of corporate innovation. If there is a significant difference in these two types of appointments, then this may raise larger concerns about endogeneity issues of strategic appointments. To test this, we created two connection variables to capture whether connections are established through regular or irregular turnover. Regular turnover is defined as appointments made after a predecessor retires (age > 57) or completes their tenure (term > 5 years), while irregular turnover is defined as other circumstances.

The results shown in Table 6 indicate that both types of connections have a large and statistically significant impact on the corporate innovations. In particular, we find that the estimated effect of establishing a connection with regular turnovers is almost identical to the estimated effect of irregular turnovers.

Third, following, we examined the determinants of a city's patronage connections status. If the strategic appointment is established, cities with PCNs tend to have higher

GDP, larger populations, and better economic development levels. To do so, we use patronage connections indicators (at year t+1) as the dependent variable and a series of city economic variables (at year t) as the independent variables. Column (3) of Table 6 shows that the relationship does not appear to be significantly correlated with a city's previous growth rate, e.g., financial status, population or innovation outputs.

[Insert Table 6 here]

Taken together, these results suggest that strategic appointments cannot be the main determinant of the performance premium we observe.

4.4 Robustness tests

4.4.1 Alternative measures of corporate innovation

We conduct a series of additional tests to validate our baseline results. First, we use different measures of corporate innovation. In the previous analysis, we used the adjusted number of patent applications and the number of patent citations in period t+2 as explanatory variables. In column (1) of Pannel A Table 7, we use the number of patent applications in year t+1 (*F1LN(PATENT)*) as an explanatory variable (Lerner & Seru, 2021). Columns (3) through (5) use the unadjusted number of patent applications (*LN(PATENT)_NOADJ*), province-adjusted (*LN(PATENT)_PRO*) and industry-adjusted number of patent applications (*LN(PATENT)_IND*) as explanatory variables, respectively. The main results remain robust in all models. In addition, we further replace the explanatory variables with R&D expenditures, which are measured by the natural logarithm of R&D expenditures (*LN(RD)*) and the ratio of R&D expenditures to total assets (*RD/ASSETS*), respectively, and the results are shown in columns (5) and (6), which show that the results remain unchanged.

4.4.2 Alternative estimation strategy

We also conduct estimation using Poisson regression. Since the patent application data itself is a count variable, we use the raw, unadjusted, unlogarized values of patent applications that are eventually granted as the explanatory variables and perform Poisson estimation while controlling for firm and year fixed effects. The results are shown in column (7) of Pannel A in Table 7, where we can find our conclusions remained unchanged.

4.4.3 Controlling for high dimensional fixed effects

In the previous analysis, we found a significant positive correlation between PCN and corporate innovation. However, in previous specification, variations in connection can come from both the appointment of new city leaders and the exit of incumbent provincial leaders. We estimate a more restrictive model that includes fixed effects for every unique pair of city leaders (connection group fixed effects). When controlling for city leader pair fixed effects, the variations that we use for estimation will only come from changing the identity of provincial secretaries. Furthermore, we also control for province×year fixed effects to absorb any province-specific economic or political shocks on transfers, such as those induced by changes in the provincial leadership or the central government's regional policies.

Pannel B of Table 7 shows the results of controlling for multiple fixed effects. Column (1) and (2) show the results of controlling for connection group fixed effects, and column (3) and (4) show the results of controlling for both connection group fixed effects and Province ×Year Fixed Effects, it can be observed that our conclusions remain robust.

4.4.4 Alternative cluster of standard errors

In the previous analysis, the standard errors are clustered at the city level, since PCN is a city-level variable. We further alternate the clusters of the standard errors by replacing firm and city×year level to better control for heteroskedasticity and within-group correlation. In column (1) and (2) of Pannel C in Table 7, standard errors are clustered to the firm level, and in column (3) and (4) standard errors are clustered in the city×year level. As shown in Table 7, the coefficient estimate remains largely the same.

4.4.5 Controlling for city and the personal characteristics

In addition, we control for a series of city-level characteristics and characteristics of city leaders. As for the city level characteristics, we further control for the size of the city's population (*LN(POPULATION)*) and the level of economic development (*LN(GDP)*), the results are shown in columns (1) and (3) of Pannel D, where the results robust. For city leaders' characteristics, we further control for the tenure (*TENURE*), age (*AGE*), ethnicity (*MINOR*), gender (*GENDER*), work experience in company (*SOE_EXP*), and work experience in the financial sector (*FINANCE*). Columns (2) and (5) control for the characteristics of the mayors, and Columns (3) and (6) control for the personal characteristics of both the city secretary and the mayor. We find that the conclusions remain robust.

4.4.6 Subsample analysis

An important potential question is whether our results are driven by a small number of cities that have much more patents application and citations. To address this issue, Pannel E shows the results using several different subsamples.

In column (1) and (2), we exclude provincial capitals and vice-provincial cities, which usually have a closer connection to their provinces than ordinary prefecture-level cities. Column (3) and (4) exclude the minority regions, since those aeras tend to have receive

more favorable resources from the central government. In the last two columns, we further break the sample into the more developed (Eastern or coastal) regions and the undeveloped (non-Eastern) regions. The main results remain robust to these subsample analysis, which suggest that our main results are not driven by peculiarities of any specific region.

[Insert Table 7 here]

5. Plausible Underlying Channels

5.1 Favoritism in resource allocation

In this subsection, we provide a few evidence suggesting that more favoritism in resource allocation could be a underlying channel through which PCN promote corporate innovation outputs. The first test we undertake is to explore whether cities with PCNs receive greater resources or policy favors from the higher-level governments. We concentrate on Provincial Special Economic Zones (PSEZs), as the establishment of PSEZs is typically determined by provincial-level governments, with the ultimate decision-making authority residing in the Provincial Party Secretary. Cities that secure PSEZs often benefit from allocations of innovation and development funds, venture capital injections, and tax incentives provided by the provincial government (Lu et al., 2019). For instance, Lu et al. (2019) and Tian and Xu (2021) discovered that some place-based policies can provide local firms with favorable access to finance, ultimately fostering firms' innovation.

Specifically, we gathered pertinent information on the establishment of PSEZs from annual reports of various prefecture-level cities and provincial governments. We introduced a dummy variable, denoted as PSEZ, which takes the value of 1 if city *i* has been established a PSEZ in year *t* and 0 otherwise. The first column of Table 8 reports the estimated coefficients, revealing that the coefficient for *CONNECT TO SEC* is statistically significant at the 5% level. This suggests that, compared to cities without PSEZs, those with PSEZs exhibit a significantly higher probability of being PSEZs.

The second test we undertake aims to investigate whether firms located in cities with PCNs experience more favorable resource allocation. Previous studies have delved into the impact of resource acquisition on corporate innovation. Notably, Jourdan and Kivleniece (2017) discovered that subsidies from the government can assist firms in

alleviating resource constraints during the innovation process, thereby fostering corporate innovation. Mansfield (1986), Wilson (2009) and Mukherjee et al. (2017) have demonstrated that tax credits exert a significantly positive influence on firm R&D investment and subsequent innovation. Finally, extensive literature, such as Ross (1993), Rajan and Zingales (1998) and Beck and Levine (2004), reveals that banks play a crucial role in alleviating external financing constraints faced by firms, elucidating one mechanism through which banking development contributes to innovation.

In particular, we employ natural logarithms of the subsidies the government (*LN(SUBSIDY)*, column (2) of Table 9, technological subsidies (*LN(TECSUBSIDY)*, Column (3)), effective tax rates (*ETR*, Column (4)), and bank loans (*LN(LOAN)*, column (5)). Columns (2) to (5) of Table 9 present the estimated coefficients, with the results indicating that the coefficient for *CONNECT TO SEC* are all statistically significant. The estimator demonstrate that government subsidies and technological subsidies increase by approximately 16.4% and 21.8%, respectively, compared to cities without PCNs. Additionally, the effective tax rate for companies decreases by around 0.8%, while bank loans increase by about 15.8%. Our results show that cities with PCNs tend to receive more resources from provincial governments. Firms in these cities benefit from increased government subsidies, preferential tax treatment, and better access to bank loans.

Taken together, our results show that cities with PCNs are likely to receive more resources from provincial-level governments. This suggest that favoritism in resource allocation is a plausible underlying channel through which PCN promotes innovation.

[Insert Table 9 here]

5.2 Tolerance of failure

In China, officials facing career development pressures and limited tenure often prioritize short-term projects that promote economic growth over long-term initiatives such as innovation. As previously discussed, PCN creates an implicit guarantee for clients, which we believe increases clients' tolerance for business failures within their jurisdiction. This is evident at the corporate level, where a client who is not short-sighted is less likely to dismiss a CEO based on poor performance, avoiding a focus on short-term economic achievements. In this subsection, we examine the tolerance of client's failure tolerance. .Following Manso (2011), Luong et al. (2017) and Griffin et al. (2021), we define a dummy variable, *ABNORMAL TURNOVER*, which takes a value of 1 if there is an abnormal turnover of the chairman or CEO, and 0 otherwise. Interaction terms are created by multiplying the *CONNECT TO SEC* with the previous year's return on assets (*DROA*) and the deviation from the industry and provincial average return on assets (*DINDROA*). If both interaction terms, *CONNECT TO SEC* × *DROA* and *CONNECT TO SEC* × *DINDROA*, are positive, it indicates that clients exhibit a higher tolerance for failure. Additionally, we subdivided the analysis sample into central state-owned enterprises (Central-SOEs), local state-owned enterprises (Local-SOEs), and private enterprises.

In Table 8, the coefficients for *CONNECT TO SEC*×*DROA* and *CONNECT TO SEC*×*DINDROA* are all significantly positive only in state-owned enterprises (SOEs), as shown in columns (1) and (2). This result is particularly significant in Local-SOEs, as shown in columns (3) and (4), whereas it lacks statistical significance in Central-SOEs (columns (5) and (6)) and private enterprises (columns (7) and (8)). Since CEOs and chairman of state-owned enterprises are appointed directly by the government, the decision-making authority for their replacements rests with the government rather than

the corporate board. In Central-SOEs, the State-owned Assets Supervision and Administration Commission (SASAC) holds the power to make personnel appointments, usually operating at a higher administrative level than municipal governments. As a result, city officials (i.e. clients) lack authority in the personnel appointment process for central state-owned enterprises. This indicates that PCN significantly increases the tolerance of failure among leaders in prefecture-level cities.

Therefore, this suggests that PCN significantly increases the tolerance of failure, especially in Local-SOEs.

[Insert Table 8 here]

5.3 Reduce uncertainty

In order to test the mechanism of reducing uncertainty, we divided it into two dimensions: economic policy uncertainty and corporate perceptions of uncertainty.

As for economic policy uncertainty, a key empirical challenge is to develop a measure of local governments' policy agenda that is comparable across time and locations. Following the approach of Jiang and Zhang (2020), we constructed two indicators, *FPRIOR* and *TOPICSHARE*, using city-level GWEs data. Specifically, Jiang and Zhang (2020) employed Latent Dirichlet Allocation (LDA) models in a previous study to analyze government work reports (GWRs), we utilized the provided word list and conducted text analysis on government work reports from prefecture-level cities and provinces. The first indicator (*FPRIOR*) is a binary measure indicating whether a city's top policy priority (i.e., the topic with the highest share in its GWR aligns with its provincial government's top priority. The second indicator, *TOPICSHARE*, measures the extent to which a city dedicates its GWR to discussing the policy topic that holds the highest share in the provincial GWR for the same year. Additionally, as for the third variable, using the keywords from Baker et al. (2016), we constructed a set of EPU

indexes at the city level using GWRs. The high value of EPU is the high level of economic policy uncertainty is.

In Table 10, column (1) and (2) show positive and statistically significant results. This indicates that city leaders with PCNs are more inclined to allocate greater GWR to discuss policy issues that are of primary concern to their provincial patrons, compared to those without PCNs. This approach fosters network-based policy coordination, ensuring consistency and stability in policies across different administrative levels. Conversely, the last column shows a statistically negative result. All these results show that PCN helps reduce policy uncertainty.

As for firms' perception of uncertainty, we employed a text analysis approach. Specifically, we utilized a dictionary on corporate uncertainty perception provided by Campbell et al. (2014) and Chiu et al. (2018). Text analysis was applied to the textual content found in firms' financial statements and management discussions and analyses, as provided by the aforementioned dictionaries. This process allowed us to derive a measure of uncertainty perception at the firm level. The detailed results are presented in Table 9 Panel C, with the first and second columns representing text analysis of financial statement content, and the third column representing text analysis of management discussions and analyses. Notably, the coefficients for *CONNECT TO SEC* in all cases were consistently negative and statistically significant, indicating a discernible negative association with firms' perception of uncertainty.

The aforementioned results indicate that PCN tend to enhance the stability of local policies, alleviate policy uncertainty, improve officials' short-sighted decision-making, and increase officials' tolerance for failure. Simultaneously, at the firm level, PCN also reduces the level of perceived uncertainty among enterprises, thereby fostering innovation output.

[Insert Table 10 here]

6. Further tests

6.1 Heterogeneity of connection

In the previous analysis, the following definitions were employed: CL attained a prefecture-level city leadership position (such as city secretary or mayor) from within the province during PL's tenure as the provincial secretary (see Section 3.4). Similarly, we adopt the same approach here to define the patronage connection with the governor (*CONNECT TO GOVN*). Both *CONNECT TO GOVN* and *CONNECT TO SEC* are simultaneously incorporated into the regression model, and the specific results are presented in the first and second columns of Table 10. It is observed that the coefficient for *CONNECT TO GOVN* is insignificant; however, the coefficient for *CONNECT TO SEC* remains statistically significant at the 1% level.

Provincial Party Secretaries typically exert overwhelming influence over the selection of officials within the province (Li & Zhou, 2005). This outcome underscores the significance of the patronage connection with the Provincial Party Secretary.

[Insert Table 11 here]

6.2 Heterogeneity of property rights

In this section, we further analyze the role of PCN in enterprises with different property rights. We categorize enterprises into private firms, centrally controlled state-owned enterprises (central-SOEs), and locally controlled state-owned enterprises (local-SOEs) based on the hierarchy of ultimate controlling owners, with centrally controlled state-owned enterprises serving as the benchmark group.

The results are presented in Table 11. It shows that the coefficient of the interaction term C*ONNECT TO SEC* × *LOCAL SOE* is positive and statistically significant at the 1% level. This finding is consistent with the results in Section 5.2 (Table 9, Panel B), indicating that PCN primarily operates through locally controlled state-owned

enterprises. In contrast, the coefficient of CONNECT TO SEC is no longer significant. This indicates that within central SOEs, PCN does not have an effect on firms' innovation.

In China, the ultimate controllers of Central-SOEs are typically the central State-owned Assets Supervision and Administration Commission (SASAC). The chairmen and CEOs of SOEs in China have dual roles as manager and politician (Li & Zhou, 2005). In the administrative hierarchy of China, city-level officials hold lower administrative ranks than the CEOs or chairman of Central-SOEs. As a result, city-level leaders are unable to exert significant influence over Central-SOEs.

[Insert Table 12 here]

6.3 Heterogeneity of formal institution

In this subsection, we examine the effect of PCN on firms' innovatiob in regions with different institutional environments. We anticipate that PCN, as an informal institution, plays a more significant role in weaker institutional environments. Empirical evidence indicates substantial institutional variations across regions in China (Brandt & Li, 2003; Li et al., 2008). In areas with weaker external institutions, governments may impose stringent regulations (red tape) or impose "extralegal" fees on firms (Guriev, 2004; Johnson et al., 2000; Johnson et al., 2002). Additionally, legal systems in such regions may lack the strength to safeguard property rights and enforce contracts (Hay & Shleifer, 1998). Consequently, in regions with weaker external institutions, PCN, as an informal institution bridging political hierarchies, brings more external resources to local enterprises and reduces uncertainty. We employ two methods to measure external institutions. First, we use the Legal Environment Effectiveness (LAW) proposed by Xiaolu et al. (2017) to gauge the level of legal institutions in a region; a higher LAW indicates greater effectiveness of regional business markets and

legal systems. Second, we utilize the degree of openness (OPEN) and foreign direct investment (FDI) to measure the formal external institutions in a region. Typically, in countries with weak institutions, a higher level of foreign investment and openness can alleviate the negative effects of weak institutions to some extent.

Secondly, we examined the pivotal role of Guanxi culture, the core of Chinese culture. Guanxi implies a norm of reciprocity among individuals (Park & Luo, 2001). Interpersonal relationships often entail the exchange of favors or benefits, aligning with PCN, wherein individuals involved typically refrain from actions that others might disapprove of. However, those unwilling to adhere to reciprocal norms may be perceived as untrustworthy, potentially jeopardizing the maintenance of their personal networks. Drawing on the definition by Park and Luo (2001), we employed per capita alcohol consumption as a proxy for the Guanxi culture of a region.

The results are presented in Table 12. Here, we generated a dummy variable, *ALTER*, using the median of the sample. If the effectiveness of legal system (*LAW*), degree of openness to the outside world (*OPEN*), and utilization of foreign capital (*FDI*) in a region are below the sample median, *ALTER* is assigned a value of 1; otherwise, it is assigned a value of 0. As for guanxi culture, if the per capita alcohol consumption in a region exceeds the sample median, *ALTER* is assigned a value of 1; otherwise, it is assigned a value of 0. It can be observed that the coefficients of *CONNECT TO SEC* × *ALTER* in columns (1) to (8) are consistently positive and statistically significant. These results indicate that in cities with weaker markets and ineffective legal systems, PCN has a more substantial positive impact on corporate innovation. In regions with a stronger guanxi culture, the influence of PCN is even more pronounced. These findings support the perspective that in China, PCN, serving as a lubricant between the political hierarchy, can act as an alternative when external systems fail in weak institutional

settings, representing a suboptimal choice in China's governance. It provides significant economic benefits and helps overcome the failures of both state and market in a transitioning economy.

[Insert Table 13 here]

6.4 Effects on other corporate outcomes

At last, we examined various additional economic consequences of PCN for enterprises. Firstly, we investigated the impact of PCN on innovation efficiency within firms. Following the approach outlined by, we employed the natural logarithm of the quantity of innovation output per million in assets (*LN(PATENT/RD)*). Secondly, we assessed whether PCN strengthened the emphasis placed by firms on high-tech talents by using the proportion of innovative technical personnel as a metric (*RDPEOPLE*). Finally, we explored whether PCN enhanced the importance given by enterprises to innovation. To measure this, we employed a text analysis approach on specific sections of corporate financial reports (*INNOMDA1*), board reports (*INNOMDA2*), and management discussion and analysis (*INNOMDA3*).

The results are presented in Table 13, indicating that the coefficients for *CONNECT TO SEC* are all positive and statistically significant. These findings suggest that PCN enhances innovation efficiency within enterprises and strengthens their emphasis on high-tech talent and research and development innovation.

[Insert Table 14 here]

7. Conclusion

Patron–client networks (PCNs) are often perceived as impediments to effective political governance in transitional economies and have adverse impacts on aggregated economic outputs. This study shows that PCNs can foster innovation at the micro-economic level. Firms situated in cities with established PCNs experience an 8.7% and 7.9% increase in innovation output and citation rates, respectively. PCNs enhance corporate innovation by fostering mutual trust between government hierarchies, promote city leaders' tolerance of failure, facilitating more favorable resource allocation, and mitigating economic policy uncertainty and other perceived uncertainty faced by firms. We also find that PCNs operate primarily through patronage connections with provincial party secretaries, rather than with provincial governors. The impact of PCNs is more pronounced among local state-owned enterprises and in the absence of robust external institutions. Overall, our results highlight the importance of PCNs in providing an alternative form in political governance and functioning, promoting firm-level innovation efficiency and fostering economic growth.

Patron–client networks (PCNs) are often perceived as impediments to effective political governance in transitional economies and have adverse impacts on aggregated economic outputs. This article employs China as a case study to show how informal intra-party networks, patron-client networks (PCN), influence firms' innovation. This study shows that PCNs can foster innovation at the micro-economic level. Firms situated in cities with established PCNs experience an 8.7% and 7.9% increase in innovation output and citation rates, respectively. Further examinations, including several additional tests, suggest a likely causal relationship.

First, PCNs enhance corporate innovation by fostering mutual trust between government hierarchies. Second, PCNs promote city leaders' tolerance for failure in

local state-owned enterprises. Third, PCN enhances trust between government layers and increase the likelihood of cities with PCNs obtaining provincial-level economic special zones. Firms located in PCN-cities show significantly higher levels of government subsidies, lower income and sales tax rates, and increased bank loans. Last, PCNs improve policy coordination among government levels, reduce policy uncertainty, and decrease firms' uncertainty perception.

In addition, a series of further tests are conducted. We observed that patronage connections with provincial party secretaries rather than provincial governors foster innovation in enterprises. Second, the positive impact of PCNs on firms' innovation is notably significant in locally owned state enterprises but have no effects on centrally owned firms. Third, in China, when external institutions fail in a weak institutional environment, PCNs serve as a lubricant between political tiers, representing an alternative solution and a secondary choice in Chinese political governance. They yield significant economic benefits and aid in overcoming the failures of transitioning economies and markets. Finally, we discovered that PCNs enhance innovation efficiency in enterprises and elevate their emphasis on innovation and innovative talent.

In conclusion, our research underscores PCNs as a secondary option in non-democratic, weakly governed countries and emphasizes their crucial role in fostering innovation. To the best of our knowledge, this article is the first to explore the role of PCNs at the micro-level of enterprises. While our empirical analysis primarily focuses on China, the discovery of PCNs as a vital tool in political elite governance extends beyond China to authoritarian countries. For instance, Grindle (1977) argued that between 1929 and 2000, the patronage networks within Mexico's ruling party, facilitated politicians in garnering support for policy changes and undertaking crucial governmental activities. Similarly, in research on the early state-building of the Soviet

Union, Willerton (1991) noted that PCN between central and local leaders aided the central authority in effectively controlling remote areas. These examples, along with our findings, indicate that in regimes with relatively weak formal institutions, patronage networks may serve as significant sources of informal state capacity.

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Appendix

Table A.1 Definitions of variables.

Variable Name	Definition
LN(PATENT)	Number of patents applied for in year t+2 that were eventually granted. See details in 3.2. This measure is constructed using truncation bias adjusted patent counts and citations per patents as described in 3.2.
LN(CITATION)	Citation-weighted patent count of patents applied in year t+2 that were eventually granted. This measure is constructed using truncation bias adjusted patent counts and citations per patents as described in 3.2.
CONNECT TO SEC	CL was first promoted to a prefecture-level city leadership position (as city secretary or mayor) from within the province when PL was serving as the provincial secretary. See details in 3.3.
AGE	Age of a company, calculated as the natural logarithm of the number of years since the company's establishment plus one.
LEV	Company's capital structure, measured by the ratio of its liabilities to its assets at the end of a period.
SIZE	Company size, measured by the natural logarithm of total assets at the end of a period.
OUTDRATE	Size of board of independent directors, measured by the number of total directors scaled by independent directors.
GROWTH	Company's growth, measured by the growth rate of enterprise operating revenue
CASHFLOW	Cash holdings, calculated as the ratio of cash and cash equivalents to the difference between total assets, and cash and cash equivalents.
ROA	Return on assets, measured by the ratio of net profits for a period to total assets at the end of this period.
TOP1	The largest shareholder's percentage ownership, indicating the degree of ownership concentration.
MSHRATE	Managements' ownership, measured by management's shareholding ratio
TOBINQ	Company's market value, measured by the ratio of the sum of market values of equity and net liabilities to total assets at the end of period; the market value of unlisted shares is substituted for net assets.
MTOB	Book to market ratio, measured by dividing shareholder equity by the company's market value

Notes: This table shows definitions of variables.

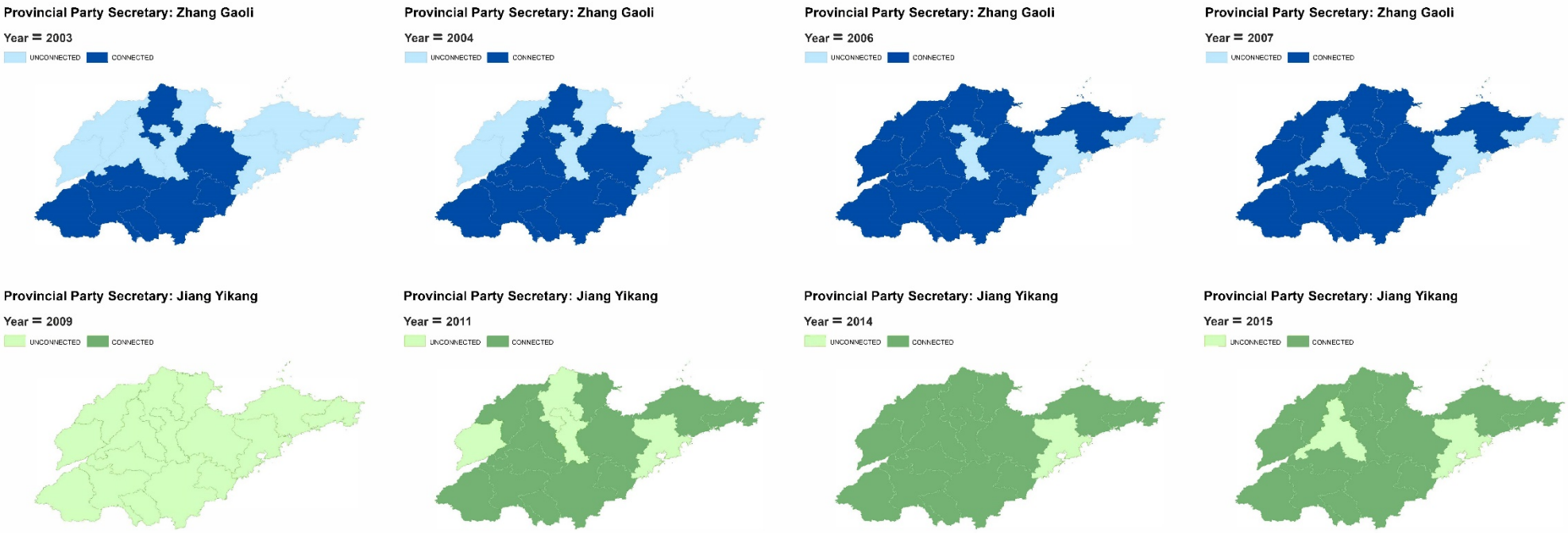

Figure 1 Variation in Connection Status: Shandong Province, 2004–2015

Notes: This figure illustrates the over-time change in political alignments in Shandong province. The first row, makred in blue, corresponds to the tenure of Zhang Gaoli as the Provincial Party Secretary of Shandong. The second row, marked in green, represents the period during which Jiang Yikang held the position of Provincial Party Secretary in Shandong.

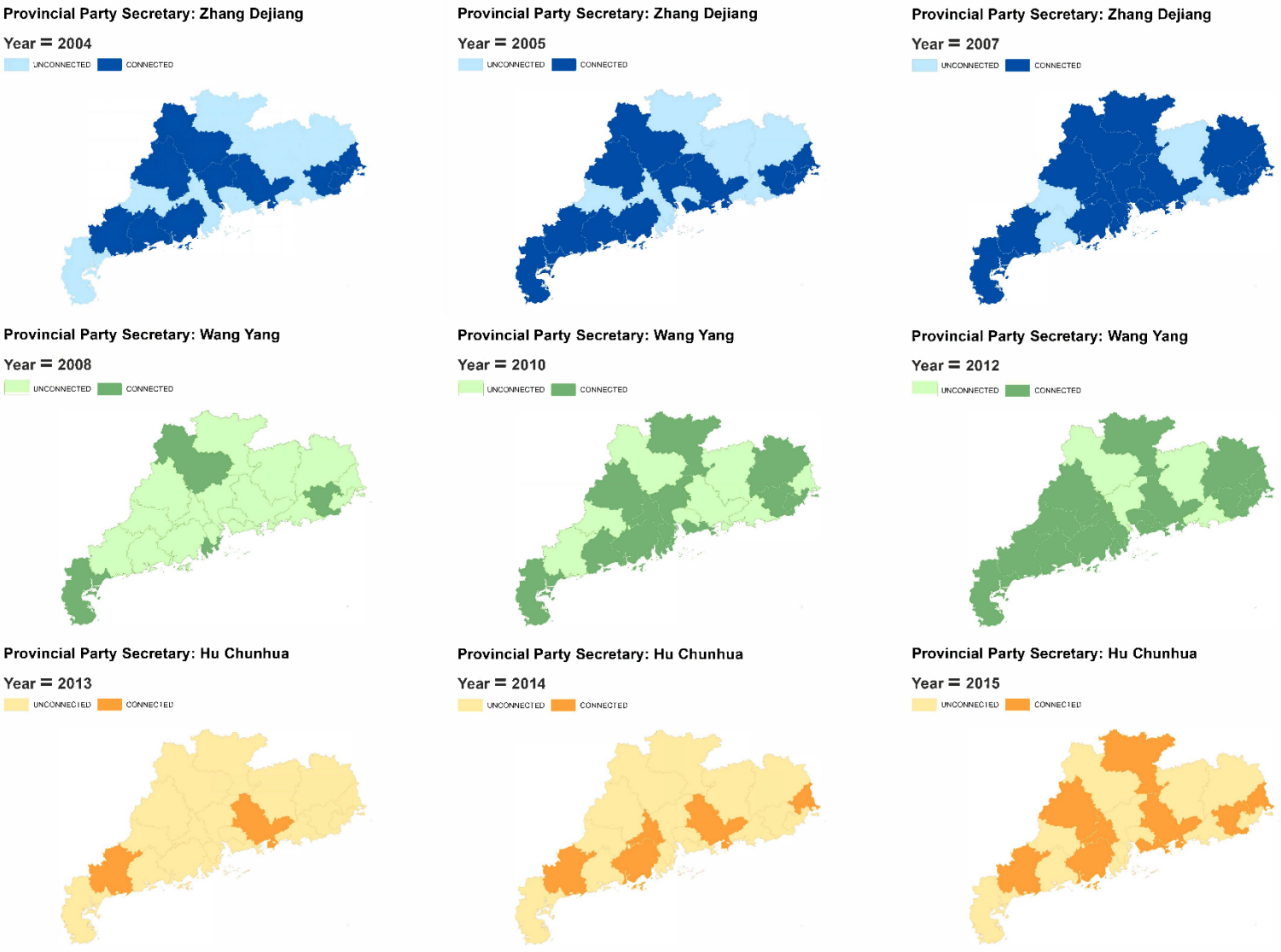

Figure 2 Variation in Connection Status: Guangdong Province, 2004–2015

Notes: This figure illustrates the over-time change in political alignments in Shandong province. The first row, makred in blue, corresponds to the tenure of Zhang Dejiang as the Provincial Party Secretary of Guangdong province. The second row, marked in green, represents the period during which Wang Yang held the position of Provincial Party Secretary in Guangdong. The third row, makred in yellow, corresponds to the tenure of Hu Chunhua as the Provincial Party Secretary of Guangdong province.

Table 1 Illustrative Examples

Client	Li Qiang	Wu Tianjun
Short Bio	(1) ~2002, in functional departments (2) 2002-2004, party secretary of Wenzhou (3) 2005-2006, secretary-general of Zhejiang	(1) 2000~2001, deputy mayor of Xinxiang (2) 2001-2006, mayor of Xinxiang (3) 2006-2011, party secretary of Xinxiang (4) 2011, mayor of Zhenzhou
Provincial secretary	Zhang Dejiang(1998-2002) Xi Jinping (2002-2007)	Chen Kuiyuan(2000-2002) Li Keqiang(2002-2004)
Year of first city leader promotion	2002	2001
Patron?	Xi Jinping	Chen Kuiyuan
PCN city	Wenzhou	Xinxiang
PCN connected period	2002-2004	2001-2002

Notes: This table shows the illustrative examples. Two examples we illustrate are Li Qiang and Wu Tianjun, who are both city-level officials in the province. For Li Qiang, he spent most of his time in functional department until 2001 and as the party secretary of Wenzhou City between 2002 and 2004. His promotion to his first city leadership post thus occurred in 2002. Following our measure, we then go back to the provincial leaders' biographies and try to find out who was the incumbent provincial secretary in 2002. It turns that it was Xi Jinping, who is now the Chairman of PRC. Our measure thus identifies Li Qiang as a connected mayor (and the city he serves as a connected city) between 2002 (C s first year as city leader) and 2004 (Li Ke's promotion to Provincial-level department).Similarly, for Wu Tianjun, our measure focuses on identifying the promotion to first city leadership posts, which is the 2001 promotion to city party secretary. Turning to provincial leaders' biographies, we can see that Chen Kuiyuan was the provincial party secretary in 2001. We therefore code Wu Tianjun as a client of Xinxiang and the city that Wu Tianjun serves will be considered as a connected city between 2001 (when C2 first becomes city party secretary) and 2002 (Wu's patron's Chen Kuiyuan retirement).

Table 2 Validation Test: Predicting Promotion and Anticorruption Investigation

Dependent Variable:	***Client Promoted to Next Level***		***Client Investigated for Corruption***	
	(1)	(2)	(3)	(4)
	Coefficient	Coefficient	Coefficient	Coefficient
	t-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic
Patrons became Standing Committee members	0.815***	0.624***	-0.081	-0.251
	(6.83)	(5.13)	(-0.32)	(-0.94)
Patrons became Politburo members			-0.208	-0.298
			(-0.54)	(-0.73)
Patrons became target of investigation			1.401***	1.606***
			(2.82)	(2.88)
MINOR		-0.333*		-0.606
		(-1.84)		(-1.15)
FEMAL		0.282		-1.118
		(1.64)		(-1.61)
COLLEGE		0.814***		-0.199
		(2.78)		(-0.66)
AGE		-6.822***		-1.757
		(-5.08)		(-0.42)
AGESQUARE		0.155***		0.051
		(5.61)		(0.68)
AGECUBE		-0.001***		-0.000
		(-6.11)		(-0.95)
CONSTANT	-4.027***	93.869***	-3.595***	8.467
	(-16.30)	(4.33)	(-10.20)	(0.11)
First Province	Control	Control	Control	Control
Year Fixed Effects	Control	Control	Control	Control
Number of Individuals	1513	1472	1467	1426
Pseudo. R^2	0.051	0.105	0.071	0.111
Observations	16784	16186	15674	15113

Note: This table shows the results of validation Test. Column (1) and Column (2) show that our measure of patronage ties strongly predicts clients' promotion when the putative patrons are promoted to the Politburo. Column (3) and Column (4) show that our measure of patronage ties strongly predicts clients' career outcomes when the putative patrons are promoted to the Politburo or become targets of anticorruption themselves. Standard errors are clustered at the individual level, and t-value are reported in parentheses. The symbols ∗∗∗, ∗∗, and ∗ denote significance at the 1%, 5%, and 10% levels, respectively.

Table 3 Validation test: Particularistic Reward for Performance from the Patron

Dependent Variable:	***Promotion***	***Disciplinary Sanctions***
	(1)	(2)
	Coefficient	Coefficient
	t-Statistic	*t*-Statistic
CRP under patron	0.310***	-0.373*
	(2.61)	(-1.66)
CRP under non-patron	0.204	0.122
	(1.39)	(0.41)
Average relative city GDP	0.120	0.465
	(0.78)	(1.55)
Average relative city population	-0.073	-0.150
	(-0.46)	(-0.47)
Average relative fiscal transfer	0.346**	-0.005
	(2.01)	(-0.01)
Patron currently a PSC/PB member	0.640***	-0.226
	(2.62)	(-0.46)
MINOR	-0.575	-0.362
	(-1.38)	(-0.29)
FEMAL	0.998***	-0.401
	(3.07)	(-0.34)
COLLEGE	0.082	0.153
	(0.46)	(0.55)
AGE	2.119***	2.440*
	(4.11)	(1.72)
AGESQ	-0.023***	-0.022*
	(-4.61)	(-1.70)
Year first promoted to bureau-level	-0.155***	0.222**
	(-4.69)	(2.30)
Year Dummy	Control	Control
Proportional hazard test	0.591	0.319
Number of Individuals	1048	1048
Number of Promotion/Purge	173	49
Observations	6744	7293

Note: The table presents coefficients from Cox proportional hazard models. The results suggest that performance delivered under the patron has greater influence over clients' career outcomes than that delivered
under non-patron. Standard errors are clustered at the individual level, and t-value are reported in parentheses. The symbols ∗∗∗, ∗∗, and ∗ denote significance at the 1%, 5%, and 10% levels, respectively.

Table 4 Summary statistics

Variable Name	Observation	Mean	S.D.	Min	P23	Median	P75	Max
LN(PATENT)	20225	1.006	1.617	0.000	0.000	0.000	1.609	7.997
LN(CITATION)	20225	1.848	1.971	0.000	0.000	1.386	3.434	6.990
CONNECT TO SEC	20225	0.620	0.485	0.000	0.000	1.000	1.000	1.000
AGE	20225	2.400	0.511	0.693	2.079	2.485	2.773	3.258
LEV	20225	0.481	0.225	0.057	0.316	0.477	0.631	1.262
SIZE	20225	21.385	1.212	18.891	20.499	21.324	22.193	24.575
OUTDRATE	20225	0.333	0.105	0.000	0.333	0.333	0.375	0.556
GROWTH	20225	0.208	0.555	-0.703	-0.031	0.122	0.303	3.830
CASHFLOW	20225	0.044	0.078	-0.204	0.003	0.043	0.089	0.264
ROA	20225	0.033	0.068	-0.277	0.010	0.033	0.063	0.215
TOP1	20225	0.369	0.158	0.092	0.243	0.345	0.486	0.750
MSHRATE	20225	0.066	0.157	0.000	0.000	0.000	0.004	0.660
TOBINQ	20225	2.028	1.853	0.200	0.840	1.471	2.513	10.934
MTOB	20225	3.794	3.642	-1.089	1.742	2.737	4.512	23.814

Note: This table shows the summary statistics. From left to right, they are variable name, sample size, sample mean, standard deviation, minimum value, the first quantile, median value, the third quantile, and the maximum value.

Table 5 Baseline results: The effect of PCN on corporate innovation

Dependent Variable:	***LN(PATENT)***		***LN(CITATION)***	
	(1)	(2)	(3)	(4)
	Coefficient	Coefficient	Coefficient	Coefficient
	t-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic
CONNECT TO SEC	0.095***	0.087***	0.085***	0.072***
	(4.08)	(3.60)	(3.01)	(2.92)
AGE		0.241**		0.821***
		(1.98)		(5.76)
LEV		0.061		0.037
		(0.66)		(0.32)
SIZE		0.224***		0.290***
		(7.37)		(8.27)
OUTDRATE		-0.069		-0.241
		(-0.26)		(-0.79)
GROWTH		0.015		-0.048***
		(0.96)		(-3.57)
CASHFLOW		0.048		0.004
		(0.41)		(0.03)
ROA		0.106		-0.750***
		(0.57)		(-3.91)
TOP1		0.093		-0.447*
		(0.47)		(-1.94)
MSHRATE		0.640**		-0.626***
		(2.17)		(-2.94)
TOBINQ		-0.045***		-0.059***
		(-4.89)		(-6.49)
MTOB		-0.006		-0.005
		(-1.61)		(-1.22)
CONSTANT	0.947***	-4.392***	1.795***	-5.935***
	(65.59)	(-6.65)	(101.35)	(-7.26)
Firm Fixed Effects	Control	Control	Control	Control
Year Fixed Effects	Control	Control	Control	Control
Adj. R^2	0.529	0.535	0.823	0.835
Observations	20225	20225	20225	20225

Note: This table presents the effects of PCN on corporate innovation. The dependent variables are patent application quantity variable, *LN(PATENT)* and patent quality variable, quantity of citations of patent in the future years *LN(CITATION)*. *CONNECT TO SEC* is the independent variable. It equals to 1 if C was first promoted to a level city leadership position (as city secretary or mayor) from within the province when P was serving as the provincial secretary. See details in 3.3. Standard errors are clustered at the city level, and t-value are reported in parentheses. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

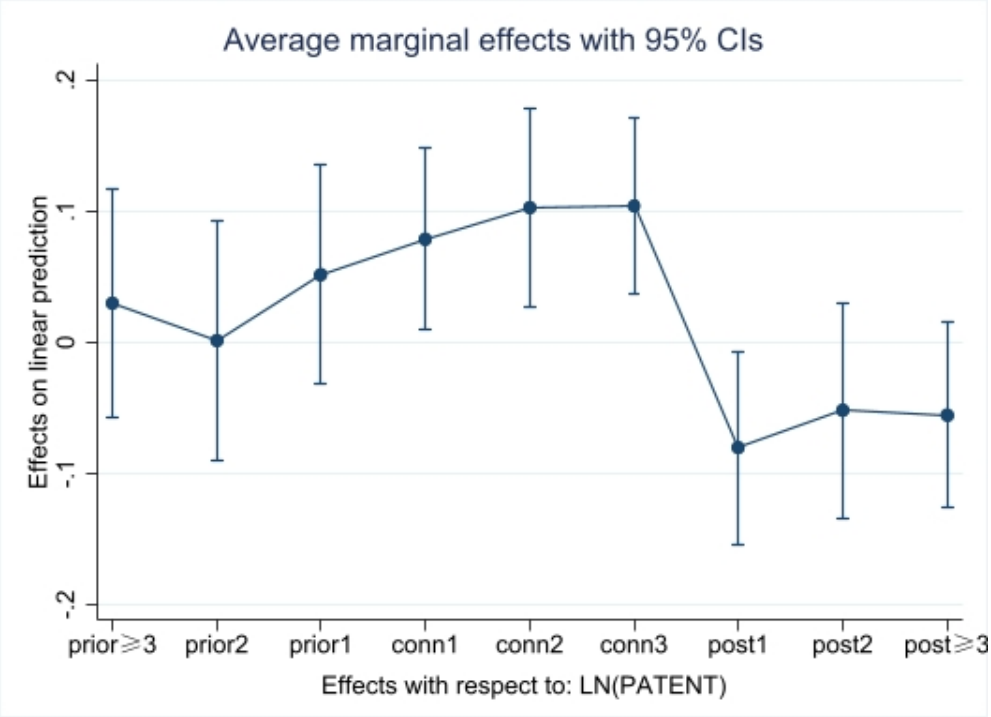

Figure 3-1 Dynamic Effects of Connection on Innovation, effects with respect to *LN(PATENT)*

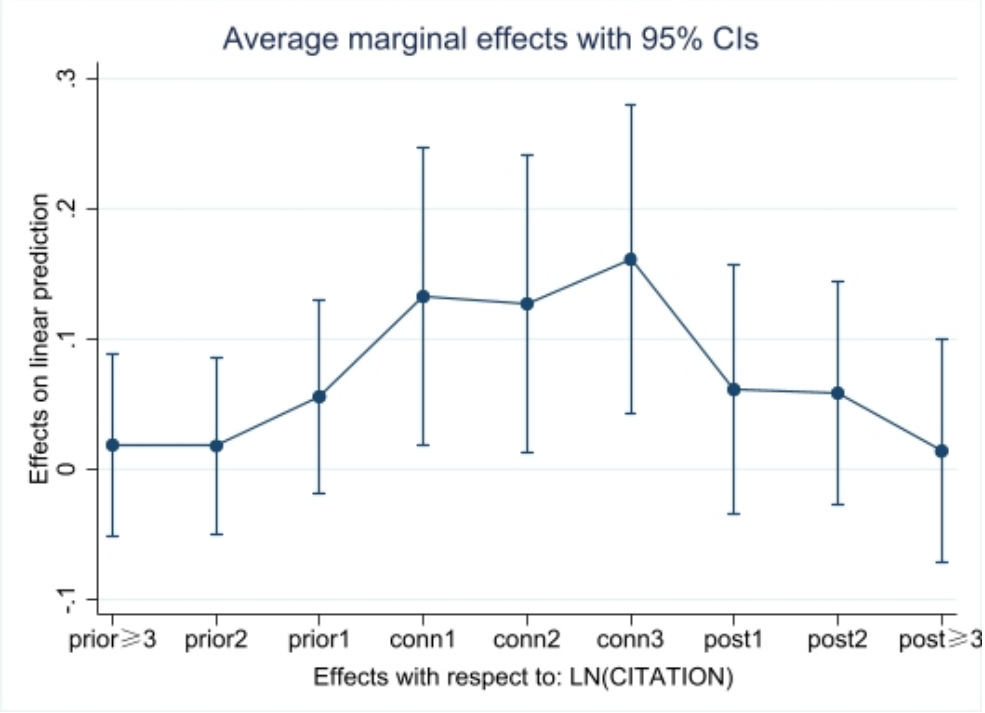

Figure 3-2 Dynamic Effects of Connection on Innovation, effects with respect to *LN(CITATION)*

Note: This figure shows the dynamic effects of connection to the provincial secretary on corporate innovation, *LN(PATENT)* and *LN(CITATION)*, respectively. Each circle indicates a point estimate, and the vertical bars are the 95% confidence intervals. Standard errors clustered at the city level.

Table 6 Testing Strategic Appointments

Dependent Variable:	***LN(PATENT)***	***LN(CITATION)***	***CONNECT TO SEC***
	(1)	(2)	(3)
	Coefficient	Coefficient	Coefficient
	t-Statistic	*t*-Statistic	*t*-Statistic
CONNECT TO SEC(REGULAR)	0.097***	0.077**	
	(3.49)	(2.40)	
CONNECT TO SEC(IRRREGULAR)	0.077**	0.068**	
	(2.35)	(2.45)	
AGE	0.243**	0.822***	
	(1.98)	(5.76)	
LEV	0.062	0.038	
	(0.66)	(0.32)	
SIZE	0.224***	0.290***	
	(7.36)	(8.28)	
OUTDRATE	-0.068	-0.241	
	(-0.26)	(-0.79)	
GROWTH	0.015	-0.048***	
	(0.95)	(-3.57)	
CASHFLOW	0.048	0.004	
	(0.40)	(0.03)	
ROA	0.106	-0.751***	
	(0.57)	(-3.91)	
TOP1	0.094	-0.446*	
	(0.48)	(-1.94)	
MSHRATE	0.639**	-0.626***	
	(2.16)	(-2.95)	
TOBINQ	-0.045***	-0.059***	
	(-4.90)	(-6.50)	
MTOB	-0.006	-0.005	
	(-1.61)	(-1.22)	
FISCALEXP			0.589
			(0.74)
LOGPOP			-0.157
			(-1.48)
GROWTH3POP			0.883
			(1.44)
GROWTH3FISCAL			-0.234
			(-0.69)
GROWTH3GDP2			-0.004
			(-0.46)
LNPATENTMOV3			-0.052
			(-0.77)
Constant	-4.389***	-5.934***	2.828*
	(-6.65)	(-7.27)	(1.68)
Firm Fixed Effects	Control	Control	Control
Year Fixed Effects	Control	Control	Control
Adj. R^2	0.535	0.835	0.172
Observations	20225	20225	1140

Note: This table estimates separately for connections established through regular and irregular turnovers in column (1) and column (2), and try to prove that prior cities' growth trends do not affect city's patronage connection. A regular turnover is defined as an appointment following the predecessor's retirement (age > 57) or a full-term tenure (tenure > 5 years), and an irregular turnover is defined otherwise. Standard errors are clustered at the city level, and t-value are reported in parentheses. The symbols ∗∗∗, ∗∗, and ∗ denote significance at the 1%, 5%, and 10% levels, respectively.

Table 7 Robustness tests

Pannel A: Alternative measures of corporate innovation and alternative estimation strategy

Dependent Variable:	***F1LN(PATENT)***	***LN(PATENT)_NOADJ***	***LN(PATENT)_PRO***	***F2LN(PATENT)_IND***	***LN(RD)***	***RD/ASSETS***	***PATENT***
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
	t-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic
CONNECT TO SEC	0.054***	0.049***	0.009**	0.007**	0.427***	0.001***	0.054***
	(2.64)	(3.77)	(2.13)	(2.18)	(4.11)	(3.10)	(3.92)
AGE	0.375***	0.285***	0.033	0.013	1.959***	0.004***	0.153***
	(3.59)	(3.17)	(1.46)	(0.60)	(3.63)	(5.44)	(5.26)
LEV	0.071	0.108*	0.008	0.038***	-1.057**	-0.003***	0.050
	(0.87)	(1.85)	(0.66)	(2.75)	(-1.99)	(-3.67)	(1.03)
SIZE	0.261***	0.150***	0.029***	0.035***	0.570***	0.000**	-0.012
	(9.83)	(7.45)	(6.03)	(7.56)	(3.76)	(2.25)	(-1.05)
OUTDRATE	-0.176	-0.314*	-0.088**	-0.014	-2.629**	-0.006***	-0.297**
	(-0.81)	(-1.84)	(-2.56)	(-0.40)	(-2.33)	(-4.90)	(-2.30)
GROWTH	-0.021	-0.031***	-0.007***	-0.007***	-0.066	-0.000	-0.036***
	(-1.46)	(-3.36)	(-3.51)	(-3.27)	(-0.96)	(-1.63)	(-2.94)
CASHFLOW	0.037	0.021	-0.006	-0.003	0.668	0.003***	-0.077
	(0.32)	(0.25)	(-0.30)	(-0.15)	(1.08)	(3.00)	(-0.84)
ROA	0.201	0.363***	0.088***	0.109***	-1.268	0.000	0.551***
	(1.19)	(2.75)	(2.84)	(3.64)	(-1.37)	(0.35)	(4.12)
TOP1	0.017	-0.131	0.010	0.094***	-3.743***	-0.002	-0.042
	(0.09)	(-1.16)	(0.40)	(3.51)	(-4.00)	(-1.25)	(-0.63)
MSHRATE	-0.087	0.457**	0.082*	0.077**	1.728	0.003	-0.208**
	(-0.32)	(2.17)	(1.67)	(2.01)	(1.30)	(1.09)	(-2.46)
TOBINQ	-0.057***	-0.034***	-0.007***	-0.007***	-0.263***	0.000	-0.011*
	(-7.32)	(-5.66)	(-4.78)	(-5.55)	(-4.93)	(1.45)	(-1.67)
MTOB	-0.012***	-0.009***	-0.002***	-0.002***	-0.013	0.000	-0.008***
	(-4.20)	(-3.32)	(-3.51)	(-2.83)	(-0.68)	(0.58)	(-2.68)
Constant	-5.348***	-2.870***	-0.300***	-0.430***	-6.353*	-0.010**	1.714***
	(-9.04)	(-6.53)	(-2.78)	(-4.31)	(-1.92)	(-2.02)	(6.41)
Firm Fixed Effects	Control	Control	Control	Control	Control	Control	Control
Year Fixed Effects	Control	Control	Control	Control	Control	Control	Control
Adj. R^2/Wald	0.639	0.699	0.634	0.560	0.715	0.705	8227.76
Observations	20225	20225	20225	20225	20225	20225	20127

Pannel B: Controlling for Connection Group Fixed Effects and Province×Year Fixed Effects

Dependent Variable:	***LN(PATENT)***		***LN(CITATION)***	
	(1)	(2)	(3)	(4)
	Coefficient	Coefficient	Coefficient	Coefficient
	t-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic
CONNECT TO SEC	0.078***	0.078***	0.066***	0.057**
	(3.50)	(2.76)	(2.66)	(2.20)
AGE	0.244**	0.219*	0.823***	0.780***
	(2.01)	(1.71)	(5.85)	(5.69)
LEV	0.067	0.032	0.042	-0.037
	(0.71)	(0.36)	(0.36)	(-0.34)
SIZE	0.224***	0.224***	0.290***	0.289***
	(7.41)	(7.32)	(8.22)	(8.19)
OUTDRATE	-0.070	-0.038	-0.247	-0.161
	(-0.26)	(-0.14)	(-0.80)	(-0.55)
GROWTH	0.015	0.014	-0.048***	-0.040***
	(0.94)	(0.85)	(-3.59)	(-3.01)
CASHFLOW	0.048	0.015	0.005	-0.039
	(0.40)	(0.13)	(0.04)	(-0.34)
ROA	0.100	0.061	-0.758***	-0.807***
	(0.53)	(0.32)	(-3.96)	(-4.34)
TOP1	0.094	0.129	-0.447*	-0.337
	(0.48)	(0.67)	(-1.95)	(-1.49)
MSHRATE	0.609**	0.592**	-0.650***	-0.555***
	(2.07)	(2.00)	(-3.06)	(-2.64)
TOBINQ	-0.046***	-0.044***	-0.059***	-0.058***
	(-4.84)	(-4.88)	(-6.52)	(-5.95)
MTOB	-0.006	-0.005	-0.004	-0.002
	(-1.49)	(-1.40)	(-1.17)	(-0.58)
Constant	-4.400***	-4.352***	-5.920***	-5.846***
	(-6.73)	(-6.34)	(-7.19)	(-7.26)
Firm Fixed Effects	Control	Control	Control	Control
Year Fixed Effects	Control	Control	Control	Control
Connection Group Fixed Effects	Control	Control	Control	Control
Province×Year Fixed Effects	NO	Control	NO	Control
Adj. R^2	0.535	0.538	0.835	0.844
Observations	20225	20225	20225	20225

Pannel C: Alternative cluster of standard errors				
Dependent Variable:	***LN(PATENT)***	***LN(CITATION)***	***LN(PATENT)***	***LN(CITATION)***
	(1)	(2)	(3)	(4)
	Coefficient	Coefficient	Coefficient	Coefficient
	t-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic
CONNECT TO SEC	0.087***	0.072***	0.087**	0.072**
	(4.02)	(3.58)	(2.60)	(2.50)
AGE	0.241**	0.821***	0.241	0.821***
	(2.35)	(6.12)	(1.63)	(4.21)
LEV	0.061	0.037	0.061	0.037
	(0.69)	(0.34)	(0.68)	(0.33)
SIZE	0.224***	0.290***	0.224***	0.290***
	(7.47)	(8.12)	(3.79)	(5.96)
OUTDRATE	-0.069	-0.241	-0.069	-0.241
	(-0.29)	(-0.91)	(-0.20)	(-0.60)
GROWTH	0.015	-0.048***	0.015	-0.048*
	(1.02)	(-3.88)	(0.57)	(-2.06)
CASHFLOW	0.048	0.004	0.048	0.004
	(0.42)	(0.04)	(0.32)	(0.03)
ROA	0.106	-0.750***	0.106	-0.750***
	(0.61)	(-4.14)	(0.71)	(-3.18)
TOP1	0.093	-0.447**	0.093	-0.447*
	(0.48)	(-2.02)	(0.48)	(-1.87)
MSHRATE	0.640**	-0.626***	0.640	-0.626**
	(2.08)	(-2.74)	(1.31)	(-2.83)
TOBINQ	-0.045***	-0.059***	-0.045***	-0.059***
	(-4.70)	(-5.93)	(-3.77)	(-5.65)
MTOB	-0.006*	-0.005	-0.006	-0.005
	(-1.69)	(-1.32)	(-1.03)	(-1.02)
Constant	-4.392***	-5.935***	-4.392***	-5.935***
	(-6.69)	(-7.82)	(-3.29)	(-6.07)
Firm Fixed Effects	Control	Control	Control	Control
Year Fixed Effects	Control	Control	Control	Control
CLUSTER	FIRM	FIRM	CITY & YEAR	CITY & YEAR
Adj. R^2	0.535	0.835	0.535	0.835
Observations	20225	20225	20225	20225

Pannel D: Controlling for city and the personal characteristics						
Dependent Variable:	***LN(PATENT)***			***LN(CITATION)***		
	(1)	(2)	(3)	(4)	(5)	(5)
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
	t-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic
CONNECT TO SEC	0.090***	0.091***	0.090***	0.054**	0.067***	0.062**
	(4.46)	(4.19)	(4.02)	(2.38)	(2.62)	(2.33)
AGE	0.296***	0.302***	0.302***	0.738***	0.752***	0.753***
	(2.92)	(2.92)	(2.91)	(5.05)	(5.11)	(5.08)
LEV	0.075	0.078	0.082	-0.026	-0.019	-0.008
	(0.93)	(0.99)	(1.03)	(-0.21)	(-0.16)	(-0.07)
SIZE	0.261***	0.259***	0.259***	0.306***	0.303***	0.305***
	(9.77)	(9.73)	(9.76)	(8.27)	(8.29)	(8.35)
OUTDRATE	-0.182	-0.181	-0.176	-0.221	-0.202	-0.200
	(-0.92)	(-0.92)	(-0.89)	(-0.74)	(-0.66)	(-0.65)
GROWTH	-0.021*	-0.021*	-0.020*	-0.038**	-0.037**	-0.035**
	(-1.79)	(-1.79)	(-1.69)	(-2.45)	(-2.38)	(-2.28)
CASHFLOW	-0.064	-0.067	-0.066	-0.080	-0.094	-0.103
	(-0.67)	(-0.71)	(-0.71)	(-0.71)	(-0.82)	(-0.92)
ROA	0.019	0.020	0.034	-0.827***	-0.810***	-0.787***
	(0.12)	(0.13)	(0.22)	(-4.29)	(-4.21)	(-4.08)
TOP1	-0.006	-0.004	-0.022	-0.450*	-0.452*	-0.466*
	(-0.03)	(-0.02)	(-0.12)	(-1.84)	(-1.87)	(-1.91)
MSHRATE	0.145	0.154	0.159	-0.945***	-0.924***	-0.894***
	(0.49)	(0.52)	(0.54)	(-3.01)	(-2.99)	(-2.92)
TOBINQ	-0.031***	-0.031***	-0.031***	-0.063***	-0.064***	-0.064***
	(-4.03)	(-3.98)	(-3.95)	(-5.78)	(-5.77)	(-5.80)
MTOB	-0.007**	-0.007**	-0.007**	-0.001	-0.001	-0.001
	(-2.41)	(-2.43)	(-2.28)	(-0.25)	(-0.34)	(-0.25)
LN(POPULATION)	-0.079	-0.050	-0.041	-0.214*	-0.180	-0.156
	(-1.12)	(-0.72)	(-0.57)	(-1.73)	(-1.45)	(-1.21)
LN(GDP)	0.040	0.015	0.011	0.086	0.051	0.057
	(0.62)	(0.23)	(0.16)	(1.02)	(0.58)	(0.66)
MAYOR_TENURE		-0.013	-0.011		0.005	0.015
		(-0.53)	(-0.44)		(0.21)	(0.56)
MAYORAGE		0.231	0.257		0.459*	0.504*
		(1.36)	(1.51)		(1.70)	(1.89)
MAYOR_MINOR		-0.221***	-0.220***		-0.148	-0.171
		(-2.91)	(-2.82)		(-1.32)	(-1.40)
MAYOR_GENDER		0.008	-0.006		0.120	0.051
		(0.15)	(-0.11)		(1.59)	(0.96)
MAYOR_SOE_EXP		-0.017	-0.016		-0.007	-0.006
		(-0.52)	(-0.46)		(-0.17)	(-0.15)
MAYOR_FINANCE		-0.030	-0.023		-0.050	-0.033
		(-0.74)	(-0.54)		(-1.25)	(-0.82)
MSEC_TENURE			-0.024			-0.043
			(-0.96)			(-1.52)
MSECAGE			0.330			0.371
			(1.63)			(1.47)
MSEC_MINOR			0.036			-0.017
			(0.78)			(-0.17)
MSEC_GENDER			-0.022			-0.110
			(-0.33)			(-1.56)
MSEC_SOE_EXP			-0.006			-0.044
			(-0.19)			(-1.04)
MSEC_FINANCE			-0.032			0.041
			(-0.96)			(0.96)
Constant	-5.070***	-5.906***	-7.276***	-5.573***	-7.392***	-9.071***
	(-6.06)	(-5.88)	(-5.42)	(-5.11)	(-5.72)	(-5.48)
Firm Fixed Effects	Control	Control	Control	Control	Control	Control
Year Fixed Effects	Control	Control	Control	Control	Control	Control
Adj. R^2	0.696	0.696	0.696	0.816	0.817	0.819
Observations	16365	16256	16188	16365	16256	16188

Pannel E: Subsample analysis								
Dependent Variable:	***LN(PATENT)***	***LN(CITATION)***	***LN(PATENT)***	***LN(CITATION)***	***LN(PATENT)***	***LN(CITATION)***	***LN(PATENT)***	***LN(CITATION)***
	Exclude provincial capitals and VPCs		**Excludes minority regions**		**Eastern aeras**		**Non-eastern aeras**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
	t-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic
CONNECT TO SEC	0.064***	0.071***	0.084***	0.072***	0.064*	0.088***	0.105***	0.053**
	(2.66)	(2.60)	(3.41)	(2.87)	(1.82)	(2.65)	(2.83)	(1.99)
AGE	0.332**	0.647***	0.245**	0.816***	0.430***	0.810***	0.075	0.849***
	(2.47)	(3.12)	(2.00)	(5.70)	(2.80)	(3.99)	(0.44)	(4.56)
LEV	0.104	0.100	0.064	0.059	0.238*	0.107	-0.032	0.060
	(0.96)	(0.68)	(0.67)	(0.50)	(1.76)	(0.64)	(-0.26)	(0.37)
SIZE	0.258***	0.278***	0.226***	0.292***	0.276***	0.341***	0.214***	0.262***
	(7.15)	(6.51)	(7.46)	(8.25)	(6.91)	(6.09)	(4.34)	(5.50)
OUTDRATE	-0.162	-0.214	-0.048	-0.239	0.006	0.056	-0.172	-0.437
	(-0.59)	(-0.59)	(-0.18)	(-0.77)	(0.02)	(0.14)	(-0.34)	(-1.21)
GROWTH	-0.020	-0.048***	0.016	-0.047***	0.019	-0.068***	0.017	-0.015
	(-1.26)	(-2.63)	(1.02)	(-3.47)	(0.97)	(-4.38)	(0.67)	(-0.82)
CASHFLOW	0.107	0.177	0.041	-0.000	-0.283*	-0.377*	0.337*	0.273*
	(0.69)	(1.21)	(0.34)	(-0.00)	(-1.74)	(-1.90)	(1.92)	(1.86)
ROA	0.157	-0.678***	0.134	-0.739***	-0.135	-0.917***	0.575**	-0.402
	(0.73)	(-2.73)	(0.71)	(-3.81)	(-0.54)	(-3.60)	(2.44)	(-1.46)
TOP1	0.193	-0.501*	0.118	-0.462*	0.227	-0.360	-0.110	-0.662**
	(0.91)	(-1.79)	(0.59)	(-1.97)	(0.89)	(-1.06)	(-0.36)	(-2.14)
MSHRATE	-0.023	-0.445	0.647**	-0.610***	0.858*	-0.370	0.473	-0.686**
	(-0.07)	(-1.58)	(2.19)	(-2.87)	(1.70)	(-0.84)	(1.27)	(-2.52)
TOBINQ	-0.061***	-0.070***	-0.045***	-0.061***	-0.032**	-0.066***	-0.060***	-0.053***
	(-5.34)	(-5.72)	(-4.79)	(-6.64)	(-2.50)	(-4.58)	(-5.03)	(-3.45)
MTOB	-0.014***	-0.006	-0.006*	-0.005	-0.012***	-0.005	0.001	-0.003
	(-3.80)	(-1.14)	(-1.67)	(-1.34)	(-2.85)	(-1.26)	(0.16)	(-0.62)
Constant	-5.272***	-5.281***	-4.462***	-5.947***	-6.234***	-7.426***	-3.503***	-5.037***
	(-7.04)	(-5.52)	(-6.75)	(-7.20)	(-6.61)	(-5.87)	(-3.89)	(-5.04)
Firm Fixed Effects	Control	Control	Control	Control	Control	Control	Control	Control
Year Fixed Effects	Control	Control	Control	Control	Control	Control	Control	Control
Adj. R^2	0.617	0.831	0.535	0.835	0.518	0.811	0.541	0.854
Observations	13113	13113	19987	19987	9623	9623	10602	10602

Note: This table shows the results of several robustness tests. In Pannel A, we alternative measures of corporate innovation and estimation strategy. In Pannel A, dependent variables in column (1) to (6) are replaced by the number of patent applications in t+1 (*F1LN(PATENT)*), unadjusted patent applications (*LN(PATENT)_NOADJ*), province-adjusted applications (*LN(PATENT)_PRO*), industry-adjusted applications (*LN(PATENT)_IND*), natural logarithm of R&D (*LN(RD)*) and the ratio of R&D to total assets (*RD/ASSETS*), respectively. Column (7) of Pannel A reports the results of Poisson regression. Pannel B shows results controlling for multiple fixed effects. Column (1) and (2) of Pannel B reports results controlling for every unique pair of city leaders (connection group fixed effects), and column (3) and (4) shows the results of controlling for both connection group fixed effects and province×year fixed effects. In Pannel C, we show the results of alternative clusters of standard errors, which are frim-level standard errors in Column (1) and (2), and city×year level standard errors in column (3) and (4). Pannel D shows the results of controlling for city and the leaders' characteristics. City level characteristics include cities' population (*LN(POPULATION)*) and the economic development (*LN(GDP)*). Columns (2) and (5) control for the characteristics of the mayors, and (3) and (6) control for the characteristics of both city secretary and mayor, which is tenure (*TENURE*), age (*AGE*), ethnicity (*MINOR*), gender (*GENDER*), company work experience (*SOE_EXP*), and financial sector work experience (*FINANCE*) respectively. Pannel E gives the results subsample analysis, which is excluding provincial capitals and VPCs in column (1) and (2), excluding the minority regions in (3) and (4), and break the sample into coastal regions(column (5) and (6)) and non-Eastern regions (column (7) and (8)).Standard errors are clustered at the city level, and t-value are reported in parentheses. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 8 Plausible channels: Favoritism in resource allocation

Dependent Variable:	***PROVSEPCIALZONE***	***LN(SUBSIDY)***	***LN(TECSUBSIDY)***	***ETR***	***LN(LOAN)***	***ETC***
	(1)	(2)	(3)	(4)	(5)	(6)
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
	t-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic
CONNECT TO SEC	0.016**	0.164**	0.218**	-0.008**	0.158**	-0.006**
	(2.10)	(2.49)	(2.08)	(-2.21)	(2.15)	(-2.19)
AGE		1.405***	1.796***	-0.022	0.965***	-0.013
		(3.07)	(3.79)	(-1.65)	(3.79)	(-0.86)
LEV		0.609	-0.927**	-0.029*	9.542***	-0.331***
		(1.38)	(-2.20)	(-1.93)	(25.25)	(-7.99)
SIZE		0.987***	0.388***	-0.002	1.426***	0.047***
		(8.88)	(3.49)	(-0.71)	(17.29)	(4.09)
OUTDRATE		-0.258	-1.519*	0.070*	0.659	-0.066**
		(-0.34)	(-1.76)	(1.94)	(1.10)	(-2.72)
GROWTH		0.027	-0.092	0.005**	0.124*	0.022***
		(0.40)	(-1.22)	(2.18)	(1.84)	(9.66)
CASHFLOW		-0.254	0.459	-0.003	-3.410***	-0.128***
		(-0.47)	(0.86)	(-0.20)	(-6.51)	(-4.60)
ROA		-0.257	-1.059	0.515***	0.605	0.101
		(-0.25)	(-1.33)	(15.11)	(0.77)	(1.47)
TOP1		-0.191	-3.148***	0.052**	2.182***	0.068
		(-0.29)	(-3.86)	(2.37)	(5.28)	(1.04)
MSHRATE		2.116***	0.565	-0.006	0.633	0.125***
		(2.82)	(0.43)	(-0.19)	(0.64)	(5.11)
TOBINQ		-0.444***	-0.206***	-0.008***	-0.740***	-0.039***
		(-8.76)	(-4.42)	(-5.24)	(-16.34)	(-10.63)
MTOB		-0.012	-0.009	-0.002***	-0.000	0.011***
		(-0.60)	(-0.51)	(-2.75)	(-0.01)	(4.00)
LOGPOP	0.001					
	(0.02)					
GOVSIZE	0.048**					
	(2.28)					
LOGGDP	-0.021***					
	(-3.31)					
BRIGHTNESS	-0.054***					
	(-5.34)					
MSEC_AGE	-0.001					
	(-1.07)					
MSE_CCOUNTY_EXP	0.012*					
	(1.84)					
MSEX_PROV_EXP	0.001					
	(0.12)					
MSEX_FINANCE_EXP	-0.011					
	(-1.14)					
Constant	0.231	-13.877***	-5.302**	0.261***	-19.528***	-0.788***
	(1.01)	(-4.52)	(-2.15)	(3.37)	(-10.30)	(-3.13)
Firm/City Fixed Effects	Control	Control	Control	Control	Control	Control
Year Fixed Effects	Control	Control	Control	Control	Control	Control
Adj./ Pseudo R^2	0.005	0.823	0.560	0.167	0.627	0.423
Observations	4774	20225	20225	19571	20225	20225

Note: This table shows the results of favoritism in resource allocation channels. *PROVSEPCIALZONE* is a dummy variable, which takes the value of 1 if city i has been established a PSEZ in year t and 0 otherwise. *LN(SUBSIDY)* equals the natural logarithms of governmental subsidies of a firm in year t. *LN(TECSUBSIDY)* equals the natural logarithms of governmental technological subsidies of a firm in year t. ETR denotes the actual tax rate borne by firms in the year t, which is computed by using corporate income tax expenses divided by pre-tax profits. *LN(LOAN)* equals the natural logarithms of bank loans that a firm receive in year t. Standard errors are clustered at the city level in all columns, and t-value are reported in parentheses. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 9 Plausible channels: Tolerance of failure

Dependent Variable:	***ABNORMAL TURNOVER***							
	SOE		***LOCAL SOE***		***CENTER SOE***		***PRIVATE***	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
	t-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic
CONNECT TO SEC	0.007	-0.006	-0.008	-0.022	0.003	0.006	-0.018	-0.023*
	(0.52)	(-0.53)	(-0.72)	(-1.70)	(0.15)	(0.31)	(-1.57)	(-1.66)
CONNECT TO SEC×DINDROA	0.339**		0.365**		0.018		0.137	
	(2.00)		(2.24)		(0.06)		(0.81)	
DINDROA	-1.068***		-0.930		-1.500*		-0.611	
	(-2.67)		(-1.26)		(-1.84)		(-1.21)	
CONNECT TO SEC×ROA		0.336*		0.418**		-0.042		0.131
		(1.97)		(2.24)		(-0.14)		(0.77)
ROA	0.022	-1.020***	0.111	-0.836***	0.294	-1.137***	0.238	-0.365**
	(0.05)	(-6.43)	(0.14)	(-6.22)	(0.37)	(-3.42)	(0.48)	(-2.42)
AGE	0.056	0.050	0.068	0.071	0.023	0.023	0.112***	0.113**
	(1.06)	(0.95)	(1.39)	(1.52)	(0.30)	(0.35)	(2.63)	(2.14)
LEV	-0.100*	-0.105**	-0.195**	-0.197**	-0.111	-0.125	0.120***	0.120**
	(-1.80)	(-2.30)	(-2.32)	(-2.41)	(-1.10)	(-1.28)	(2.65)	(2.42)
SIZE	-0.044***	-0.043***	-0.048***	-0.047***	-0.033	-0.034	-0.038***	-0.038***
	(-3.52)	(-3.75)	(-3.90)	(-3.80)	(-1.43)	(-1.49)	(-3.38)	(-2.73)
OUTDRATE	0.474***	0.478***	0.247	0.249	0.779***	0.769***	0.234*	0.234*
	(3.77)	(3.15)	(0.88)	(0.90)	(3.45)	(3.65)	(1.79)	(1.79)
GROWTH	0.069***	0.069***	0.040**	0.040**	0.063***	0.063**	0.039***	0.039***
	(6.33)	(5.72)	(2.41)	(2.38)	(2.89)	(2.30)	(3.75)	(3.52)
CASHFLOW	0.035	0.042	0.021	0.023	0.033	0.040	-0.122	-0.123*
	(0.39)	(0.57)	(0.16)	(0.18)	(0.22)	(0.27)	(-1.63)	(-1.95)
TOP1	0.007	0.003	0.099	0.092	-0.015	-0.030	-0.130	-0.130
	(0.08)	(0.04)	(1.47)	(1.50)	(-0.09)	(-0.20)	(-1.56)	(-1.63)
MSHRATE	0.432	0.409	-0.603**	-0.623**	0.590	0.612	-0.079	-0.077
	(0.82)	(0.87)	(-2.28)	(-2.49)	(0.79)	(0.85)	(-0.95)	(-1.00)
TOBINQ	0.007	0.007	0.025***	0.026***	-0.009	-0.009	0.005	0.005
	(0.92)	(0.95)	(3.55)	(3.65)	(-0.71)	(-0.67)	(0.93)	(0.83)
MTOB	0.005*	0.005**	0.003	0.003	0.002	0.002	-0.000	-0.000
	(1.67)	(1.99)	(1.06)	(1.11)	(0.37)	(0.41)	(-0.03)	(-0.05)
Constant	0.931***	0.969***	1.046***	1.045***	0.775	0.862	0.672***	0.693**
	(3.30)	(3.58)	(3.18)	(3.18)	(1.48)	(1.62)	(2.72)	(2.39)
Firm Fixed Effects	Control	Control	Control	Control	Control	Control	Control	Control
Year Fixed Effects	Control	Control	Control	Control	Control	Control	Control	Control
Adj. R^2	0.044	0.043	0.054	0.054	0.042	0.042	0.112	0.112
Observations	8880	8880	4336	4336	2731	2731	9079	9079

Note: This table reports the results of officials' tolerance for failure. We defined a dummy variable, *ABNORMAL TURNOVER*, assigning a value of 1 in the case of an abnormal return of the chairman or CEO, and 0 otherwise. *DROA* represents the return on assets from the previous year, while *DINDROA* signifies the deviation from the industry and provincial average return on assets. The samples in columns (1) and (2) of the panel pertain to state-owned enterprises, columns (3) and (4) represent samples from local state-owned enterprises, columns (5) and (6) encompass samples from central state-owned enterprises, and columns (7) and (8) denote samples from private enterprises. Standard errors are clustered at the city level in all columns, and t-value are reported in parentheses. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 8 Plausible channels: Reduce Uncertainty

Pannel A: City level economic policy uncertainty			
Dependent Variable:	***FPRIOR***	***TOPICSHARE***	***EPU***
	(1)	(2)	(3)
	Coefficient	Coefficient	Coefficient
	t-Statistic	*t*-Statistic	*t*-Statistic
CONNECT TO SEC	0.030**	0.002**	-0.018**
	(2.11)	(2.44)	(-2.42)
LOGPOP	-0.036	0.003	0.002
	(-0.53)	(0.70)	(0.60)
GOVSIZE	-0.130**	0.008	-0.011
	(-2.07)	(0.92)	(-0.47)
LOGGDP	-0.086***	-0.000	0.008*
	(-2.94)	(-0.17)	(2.08)
BRIGHTNESS	-0.089**	-0.000	0.022***
	(-2.20)	(-0.12)	(5.09)
MSEC_AGE	0.000	0.000	-0.002*
	(0.07)	(0.30)	(-1.86)
MSE_CCOUNTY_EXP	0.023	0.001	-0.010**
	(1.49)	(0.48)	(-2.18)
MSEC_PROV_EXP	0.012	-0.001	0.017**
	(0.73)	(-0.90)	(2.66)
CONSTANT	1.014**	0.029	0.352***
	(2.27)	(0.89)	(5.96)
City Fixed Effects	Control	Control	Control
Year Fixed Effects	Control	Control	Control
Adj. R^2	0.251	0.281	0.294
Observations	4774	4774	4774

Pannel B: Firm perception of uncertainty			
Dependent Variable:	***FPU_SENTENCE***	***FPU_WORD***	***FPU_MAN***
	(1)	(2)	(3)
	Coefficient	Coefficient	Coefficient
	t-Statistic	*t*-Statistic	*t*-Statistic
CONNECT TO SEC	-0.002**	-0.002**	-0.070***
	(-2.23)	(-2.23)	(-4.30)
AGE	0.042***	0.042***	0.516***
	(14.47)	(14.47)	(11.31)
LEV	0.002	0.002	0.066
	(0.32)	(0.32)	(0.82)
SIZE	0.013***	0.013***	-0.060***
	(13.17)	(13.17)	(-3.91)
OUTDRATE	0.018***	0.018***	0.456***
	(2.93)	(2.93)	(3.79)
GROWTH	-0.001	-0.001	-0.088***
	(-1.24)	(-1.24)	(-6.42)
CASHFLOW	-0.001	-0.001	0.105
	(-0.22)	(-0.22)	(1.05)
ROA	0.028***	0.028***	-3.742***
	(2.80)	(2.80)	(-20.85)
MSHRATE	0.004	0.004	-0.094
	(0.45)	(0.45)	(-0.72)
TOBINQ	0.037***	0.037***	0.163
	(3.19)	(3.19)	(0.96)
MTOB	-0.003***	-0.003***	-0.016
	(-5.10)	(-5.10)	(-1.52)
Constant	0.000	0.000	0.004
	(0.58)	(0.58)	(0.83)
Firm Fixed Effects	-0.334***	-0.334***	0.085
Year Fixed Effects	(-18.07)	(-18.07)	(0.31)
Adj. R^2	0.346	0.346	0.415
Observations	20225	20225	18683

Note: This table shows the results of reducing uncertainty channels. Pannel A provides the results at the city level. *FPRIOR* is a binary measure indicating whether a city's top policy priority (i.e., the topic with the highest share in its GWR) aligns with its provincial government's top priority. *TOPICSHARE* measures the extent to which a city dedicates its GWR to discussing the policy topic that holds the highest share in the provincial GWR for the same year. As for firms' perception of uncertainty, in Pannel B, following Campbell et al. (2014) and Chiu et al. (2018), we employed a text analysis approach to firms' financial statements and management discussions and analyses. The first and second columns represent text analysis of financial statement content, and the third column representing text analysis of management discussions and analyses. Standard errors are clustered at the city level in all columns, and t-value are reported in parentheses. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 9 Heterogeneity of Connection

Dependent Variable:	***LN(PATENT)***	***LN(CITATION)***
	(1)	(2)
	Coefficient	Coefficient
	t-Statistic	*t*-Statistic
CONNECT TO SEC	0.089***	0.086***
	(2.97)	(2.79)
CONNECT TO GOVN	-0.007	-0.038
	(-0.19)	(-1.30)
AGE	0.241**	0.821***
	(1.98)	(5.76)
LEV	0.062	0.040
	(0.66)	(0.34)
SIZE	0.224***	0.289***
	(7.34)	(8.22)
OUTDRATE	-0.069	-0.242
	(-0.26)	(-0.79)
GROWTH	0.015	-0.047***
	(0.96)	(-3.55)
CASHFLOW	0.048	0.006
	(0.41)	(0.05)
ROA	0.107	-0.748***
	(0.57)	(-3.91)
TOP1	0.093	-0.448*
	(0.47)	(-1.95)
MSHRATE	0.641**	-0.620***
	(2.18)	(-2.92)
TOBINQ	-0.045***	-0.059***
	(-4.89)	(-6.53)
MTOB	-0.006	-0.005
	(-1.60)	(-1.23)
Constant	-4.388***	-5.912***
	(-6.61)	(-7.18)
Firm Fixed Effects	Control	Control
Year Fixed Effects	Control	Control
Adj. R^2	0.535	0.835
Observations	20225	20225

Notes: In the preceding analysis, the following definitions were employed: CL attained a prefecture-level city leadership position (such as city secretary or mayor) from within the province during PL's tenure as the provincial secretary (see Section 3.3). Similarly, we adopt the same approach here to define the patronage connection with the governor (*CONNECT TO GOVN*). Standard errors are clustered at the city level in all columns, and t-value are reported in parentheses. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 10 Heterogeneity of property rights

Dependent Variable:	***LN(PATENT)***	***LN(CITATION)***
	(1)	(2)
	Coefficient	Coefficient
	t-Statistic	*t*-Statistic
CONNECT TO SEC	-0.066	-0.117
	(-1.21)	(-1.54)
CONNECT TO SEC×PRIVATE	0.136**	0.210***
	(2.24)	(2.66)
CONNECT TO SEC×LOCAL SOE	0.201***	0.278***
	(3.08)	(3.11)
LOCAL SOE	-0.379***	-0.415***
	(-3.86)	(-4.47)
PRIVATE	-0.409***	-0.446***
	(-3.92)	(-4.95)
AGE	0.793***	0.211*
	(5.95)	(1.75)
LEV	0.031	0.054
	(0.29)	(0.59)
SIZE	0.286***	0.219***
	(8.07)	(7.20)
OUTDRATE	-0.218	-0.045
	(-0.84)	(-0.18)
GROWTH	-0.047***	0.016
	(-3.81)	(1.04)
CASHFLOW	0.003	0.045
	(0.02)	(0.39)
ROA	-0.707***	0.152
	(-3.91)	(0.81)
TOP1	-0.460**	0.079
	(-2.10)	(0.40)
MSHRATE	-0.610***	0.655**
	(-2.67)	(2.22)
TOBINQ	-0.058***	-0.044***
	(-5.93)	(-5.02)
MTOB	-0.005	-0.006
	(-1.37)	(-1.63)
Constant	-5.436***	-3.846***
	(-7.08)	(-5.70)
Firm Fixed Effects	Control	Control
Year Fixed Effects	Control	Control
Adj. R^2	0.836	0.536
Observations	20225	19273

Notes: We categorize firms into private firms (*PRIVATE*), centrally state-owned firms, and locally state-owned firms (*LOCAL SOE*). The centrally state-owned firms are considered as the benchmark group for comparison. Standard errors are clustered at the city level in all columns, and t-value are reported in parentheses. The symbols ∗∗∗, ∗∗, and ∗ denote significance at the 1%, 5%, and 10% levels, respectively.

Table 11 Heterogeneity of formal institution

Dependent Variable:	***LN(PATENT)***	***LN(CITATION)***	***LN(PATENT)***	***LN(CITATION)***	***LN(PATENT)***	***LN(CITATION)***	***LN(PATENT)***	***LN(CITATION)***
ALTER=	***LOWLAW***		***LOWOPEN***		***LOWFDI***		***Guanxi Culture***	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
	t-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic
CONNECT TO SEC	0.028	-0.001	0.061**	0.039	0.059**	0.044	0.060**	0.037
	(0.87)	(-0.04)	(2.11)	(1.41)	(2.33)	(1.60)	(2.09)	(1.33)
CONNECT TO SEC×ALTER	0.089**	0.111**	0.064*	0.084**	0.065*	0.077**	0.062*	0.082**
	(2.15)	(2.44)	(1.78)	(2.18)	(1.79)	(2.04)	(1.76)	(2.19)
ALTER	0.070*	0.064	-0.083***	-0.034	-0.081**	-0.042	-0.082***	-0.040
	(1.66)	(1.18)	(-2.63)	(-0.95)	(-2.43)	(-1.19)	(-2.64)	(-1.12)
AGE	0.252***	0.832***	0.268***	0.823***	0.250***	0.836***	0.242***	0.819***
	(3.20)	(5.87)	(3.25)	(5.67)	(3.89)	(5.83)	(3.04)	(5.75)
LEV	0.069	0.045	0.070	0.060	0.044	0.028	0.060	0.036
	(1.05)	(0.38)	(1.04)	(0.50)	(0.62)	(0.23)	(0.92)	(0.31)
SIZE	0.227***	0.294***	0.216***	0.298***	0.219***	0.300***	0.215***	0.292***
	(10.99)	(8.41)	(9.84)	(8.86)	(11.15)	(8.96)	(10.10)	(8.46)
OUTDRATE	-0.048	-0.219	-0.028	-0.209	-0.036	-0.239	-0.065	-0.244
	(-0.24)	(-0.72)	(-0.14)	(-0.66)	(-0.20)	(-0.77)	(-0.32)	(-0.80)
GROWTH	0.016	-0.047***	0.017	-0.048***	0.015	-0.050***	0.015	-0.048***
	(1.08)	(-3.50)	(1.11)	(-3.55)	(0.96)	(-3.64)	(1.01)	(-3.57)
CASHFLOW	0.055	0.012	0.048	0.023	0.075	0.039	0.050	0.005
	(0.49)	(0.09)	(0.42)	(0.18)	(0.60)	(0.31)	(0.44)	(0.04)
ROA	0.106	-0.752***	0.130	-0.722***	0.102	-0.739***	0.086	-0.742***
	(0.68)	(-3.92)	(0.82)	(-3.73)	(0.58)	(-3.81)	(0.55)	(-3.90)
TOP1	0.078	-0.462**	0.087	-0.481**	0.072	-0.420*	0.083	-0.445*
	(0.66)	(-1.99)	(0.72)	(-2.06)	(0.65)	(-1.80)	(0.70)	(-1.93)
MSHRATE	0.643**	-0.622***	0.636**	-0.581***	0.632***	-0.548***	0.626**	-0.613***
	(2.28)	(-2.96)	(2.25)	(-2.77)	(3.08)	(-2.69)	(2.23)	(-2.88)
TOBINQ	-0.045***	-0.059***	-0.043***	-0.061***	-0.044***	-0.060***	-0.044***	-0.059***
	(-5.46)	(-6.48)	(-5.12)	(-6.68)	(-4.96)	(-6.52)	(-5.42)	(-6.48)
MTOB	-0.006*	-0.004	-0.007**	-0.005	-0.006	-0.005	-0.006*	-0.004
	(-1.77)	(-1.18)	(-2.02)	(-1.35)	(-1.56)	(-1.43)	(-1.83)	(-1.19)
Constant	-4.551***	-6.100***	-4.255***	-6.097***	-4.264***	-6.162***	-4.176***	-5.944***
	(-9.58)	(-7.49)	(-8.43)	(-7.75)	(-9.75)	(-7.97)	(-8.50)	(-7.38)
Firm Fixed Effects	Control	Control	Control	Control	Control	Control	Control	Control
Year Fixed Effects	Control	Control	Control	Control	Control	Control	Control	Control
Adj. R^2	0.535	0.835	0.535	0.837	0.534	0.836	0.535	0.835
Observations	20225	20225	19827	19827	19903	19903	20225	20225

Notes: ALTER is a dummy variable. If the effectiveness of legal system (*LAW*), degree of openness to the outside world (*OPEN*), and utilization of foreign capital (*FDI*) in a region are below the sample median, *ALTER* is assigned a value of 1; otherwise, it is assigned a value of 0. As for guanxi culture, if the per capita alcohol consumption in a region exceeds the sample median, *ALTER* is assigned a value of 1; otherwise, it is assigned a value of 0. Standard errors are clustered at the city level in all columns, and t-value are reported in parentheses. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 12 Effects on other corporate outcomes

Dependent Variable:	***LN(PATENT/RD)***	***RDPEOPLE***	***INNOMDA1***	***INNOMDA2***	***INNOMDA3***
	(1)	(2)	(3)	(4)	(5)
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
	t-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic	*t*-Statistic
CONNECT TO SEC	0.005***	0.382**	0.006***	0.005***	0.003**
	(2.66)	(2.39)	(3.17)	(2.67)	(2.32)
AGE	0.029***	1.660**	0.023**	0.019*	-0.001
	(5.55)	(2.16)	(2.16)	(1.93)	(-0.11)
LEV	0.001	0.690	-0.045***	-0.039***	-0.027***
	(0.26)	(0.98)	(-5.05)	(-4.58)	(-4.74)
SIZE	0.003**	0.964***	0.010***	0.011***	0.006***
	(2.09)	(5.74)	(4.64)	(5.79)	(4.41)
OUTDRATE	-0.013	-2.606*	-0.017	-0.032*	-0.027**
	(-0.91)	(-1.78)	(-0.81)	(-1.96)	(-2.30)
GROWTH	-0.002**	0.145*	-0.003***	-0.002**	-0.002***
	(-2.19)	(1.86)	(-2.89)	(-2.04)	(-3.19)
CASHFLOW	-0.002	-0.701	0.026**	0.024***	0.005
	(-0.22)	(-0.82)	(2.45)	(2.65)	(0.78)
ROA	0.021*	-0.322	0.102***	0.067***	0.042***
	(1.70)	(-0.25)	(5.49)	(4.17)	(3.55)
TOP1	-0.033***	-1.821*	-0.041***	-0.038***	-0.013
	(-3.53)	(-1.86)	(-3.09)	(-2.92)	(-1.26)
MSHRATE	0.036*	-5.074**	-0.005	-0.016	0.039*
	(1.67)	(-2.51)	(-0.27)	(-0.75)	(1.92)
TOBINQ	-0.001	0.410***	-0.008***	-0.007***	-0.004***
	(-1.40)	(5.12)	(-7.83)	(-7.95)	(-5.59)
MTOB	-0.000	-0.021	0.000	-0.000	-0.000
	(-0.80)	(-0.63)	(0.22)	(-0.34)	(-0.53)
Constant	-0.057*	-22.793***	-0.001	-0.037	0.062*
	(-1.69)	(-6.25)	(-0.01)	(-0.79)	(1.84)
Firm Fixed Effects	Control	Control	Control	Control	Control
Year Fixed Effects	Control	Control	Control	Control	Control
Adj. R^2	0.485	0.435	0.668	0.716	0.735
Observations	20225	12865	18683	16721	19431

Notes: ALTER is a dummy variable. If the effectiveness of legal system (*LAW*), degree of openness to the outside world (*OPEN*), and utilization of foreign capital (*FDI*) in a region are below the sample median, *ALTER* is assigned a value of 1; otherwise, it is assigned a value of 0. As for guanxi culture, if the per capita alcohol consumption in a region exceeds the sample median, *ALTER* is assigned a value of 1; otherwise, it is assigned a value of 0. Standard errors are clustered at the city level in all columns, and t-value are reported in parentheses. The symbols ∗∗∗, ∗∗, and ∗ denote significance at the 1%, 5%, and 10% levels, respectively.