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# Political connections, corporate innovation and entrepreneurship: Evidence from the China Employer-Employee Survey (CEES)

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## ABSTRACT

In this paper, we attempt to reconcile the mixed effects of political connections on corporate innovation. Using the China Employer-Employee Survey (CEES), we find political connections contribute to innovative activities for those firms with innovative entrepreneurs but impedes innovative activities for those without innovative entrepreneurs. After solving the endogeneity problems and correcting the sample selection bias, the baseline results do not change much. Moreover, we find political connections can help firms obtain economic benefits such as tax preference and government subsidies which, however, are utilized by firms to increase fixed asset investment. But such positive effect of political connections on fixed asset investment greatly reduces when the firm's entrepreneur has a strong spirit of innovation. These results provide a reasonable explanation for the change in the direction of the effect of political connections on corporate innovation. This paper succeeds in reconciling the mixed effects of political connections on corporate innovation by taking the entrepreneur's innovative spirit into account.

## 1. Introduction

Political connections are a widespread phenomenon in both developed and developing countries (Faccio, 2006). Innovation is a key determinant of firm competitiveness in both fast-growing high-tech sectors and more traditional sectors. In spite of a rich body of literature on the effects of political connections on innovation, the empirical evidence on their effects on the innovative performance of firms is mixed. Several studies find that political connections contribute to firm's innovative behaviors (Brogaard, Denes, & Duchin, 2015; Cumming, Rui, & Wu, 2016; Kim, Ross, & Shang, 2016; Ovtchinnikov, Reza, & Wu, 2015). Given the uncertain nature of innovation activities, political connections help firms reduce future political uncertainties, enjoy more favorable policies, and acquire disproportionate government resources, thereby improving corporate innovation. In contrast, other studies suggest that political connections have a negative effect on corporate innovation (Cheng, 2017; Kim, 2017; Shu, Page, & Gao, 2012; Xu & Yano, 2017). They maintained that an incumbent firm could increase corporate investment in innovation to maintain sufficiently low residual demand for the goods produced by an entrant, or it can use its political capital to obtain various economic benefits and thus maintain high barriers to entry. Therefore, politically connected firms may not have enough incentive to conduct innovative activities if high entry barriers formed by political connections already make market entry unprofitable for potential entrants.

In this study, we attempt to reconcile these seemingly contradictory results by positing that the effects of political connections on corporate innovation depend on entrepreneurship, that is, whether the firm's entrepreneur has the spirit of innovation. On the one

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hand, due to the highly risky and uncertain nature of innovative activities, financial constraint presents a serious challenge to technological innovation. The growing body of researches has already shown that political connections can help firms get access to bank loans on favorable terms, as well as tax preferences and government subsidies or contracts (Goldman, Rocholl, & So, 2013; Adelino & Dinc, 2014; Kim and Zhang, 2016; Cheng, 2018). In other words, politically connected firms have easy access to sufficient financial resources for innovative activities. On the other hands, an innovative entrepreneur places great emphasis on product or service innovation to satisfy or create new demand, thereby gaining market share and profits. Therefore, we hypothesize that whether politically connected firms with financial support contribute to or impede innovation is determined by the spirit of innovation of the entrepreneurs. In particular, an entrepreneur with a strong spirit of innovation makes more investment in innovation after the firm establishes political connections.

Using a unique matched employer–employee survey data focusing on Chinese manufacturing firms from 2013 to 2015, we employ Big Five personality model to construct an index measuring the innovative spirit of a firm's entrepreneurs and attempt to reconcile the mixed effects of political connections on corporate innovation. We empirically find that political connections hamper innovative activity of Chinese firms. After including innovative spirit index and its interaction term with political connections, however, we find that the total effect of political connections on innovation becomes positive when the firm's middle or senior manager has a strong spirit of innovation. The baseline results do not change after we solve the endogeneity problem of political connections and correct the sample selection bias. Moreover, our baseline results are robust across different subsamples and different measurements of innovation and innovative spirit.

To complete our analysis, we further explore the reasons why firms with politically connected managers are likely to make more R & D investment if the managers also have a strong spirit of innovation from the two aspects. First, we observe that politically connected firms enjoy favorable treatments from the government, such as tax preference and government subsidies. In other words, politically connected firms have plenty of financial resources that could have used to conduct innovative activities. Second, we consider the firm's investment decision on fixed assets which can be regarded as comparatively low-risk projects, compared to innovative activities. We find that politically connected firms have a strong incentive to increase the fixed asset investment, which may drain economic resources away from other projects like innovative activities. But such positive effect of political connections on the fixed asset investment greatly reduces, and the total effect becomes negative when the firm's middle or senior manager has a strong spirit of innovation. These results provide a reasonable explanation for the change in the direction of the effect of political connections on corporate innovation.

This paper contributes to the existing literature in the following three aspects. First, this paper fills the void in the literature on the effect of political connections on corporate innovation in China. For some reasons like lack of data, researchers have paid little attention to this empirical question in China where political connections are a common phenomenon and universally important. For example, about 68.4% of the Chinese listed firms had some political connections in 2015.<sup>1</sup> Moreover, China is now in a transitional period from a “Made in China” economy to an “Innovated in China” economy, and corporate innovation plays a key role in this process (Cheng & Lei, 2015). Therefore, studying the effect of political connections on corporate innovation is of great significance for China's transition from a planned economy to a market economy.

Second, this paper enriches the literature on political connectedness by demonstrating that the effect of political connections on corporate innovation is subject to entrepreneurship, which represents a step toward reconciling the mixed evidence on their relationship. To the best of our knowledge, this is the first empirical study to incorporate the innovative spirit into the relationship between political connections and corporate innovation. Our paper also extends the research into innovation and entrepreneurship by introducing political connections that bring economic benefits to firms.

Last but not least, different from prior studies that usually employed publicly traded firms to estimate the value of political connections (Acemoglu, Johnson, Kermani, Kwak, & Mitton, 2016; Faccio, 2006; Fisman, 2001), this paper is one of the first to use a sample of non-listed firms. In most countries, listed firms only account for a small proportion of all enterprises. For instance, there are more than 50 million Chinese firms that only include 2818 listed firms in 2015.<sup>2</sup> Importantly, listed firms are usually large-scale enterprises that are significantly different from non-listed firms, which may give rise to a sample selection problem if we only use listed firm to estimate the value of political connections. Therefore, it is hard to make a reliable assessment of the effect of political connections on corporate innovation if we only focus on a sample of listed firms. Our sample was developed by the China Employer and Employee Survey (CEES) and is mainly comprised of non-listed firms.<sup>3</sup> Based on a stratified random sampling of both firms and employees, the survey is basically representative of the overall situation of manufacturing industries in China. Therefore, this paper fills the gap in the literature by employing small and medium-sized non-listed firms to investigate the effects of political connections on corporate investment.

The paper is structured as follows. Section 2 introduces the institutional background in China and develops our hypothesis. Section 3 describes the sample data and introduces identification strategies. Section 4 presents the empirical results, tests the heterogeneity of baseline results, and conducts a variety of robustness checks. Section 5 further explores possible mechanisms that explain the main findings. Section 6 concludes.

<sup>1</sup> Data source: China Stock Market and Accounting Research (CSMAR) database. <http://us.gtarsc.com/>.

<sup>2</sup> Data source: National Bureau of Statistics of the People's Republic of China. <http://www.stats.gov.cn/>.

<sup>3</sup> In our sample, only 1% of firms are publicly traded.

## 2. Institutional background and hypothesis development

### 2.1. Institutional background in China

During the economic transition in China, the institution of the market economy is far from perfect. Chinese firms face at least four institutional deficiencies that hamper their development. The first institutional deficiency is the imperfection of the credit market, especially in the early stage of transition (Li, Meng, & Zhang, 2006). Chinese government usually possesses monopolistic control over input and product markets. One of the most important resources, credit, is tightly controlled by state-owned banks, making it very difficult for firms, especially for private firms, to obtain. Second, excessive regulatory burdens, known as red tape, have been widely observed in China (Guriev, 2004). The various forms of red tape imposed on entrepreneurs include unnecessary official routines, complex rules, and extended procedures that result in delays (Li et al., 2006). Third, heavy formal and informal taxes are imposed on firms in China. To fulfill the fiscal revenue target and maintain public facilities, local government officials engage in fee collection and fundraising activities of various names as a complement to formal taxes. A large portion of these fees and fundraising methods is erratic and in many cases unauthorized or even illegal. Finally, China also lacks a sound legal system, which is critical for property rights protection and contract enforcement. The economic transition took place in an environment lacking the rule of law to prevent the government from encroaching on firms.

Under these circumstances, firms seek various ways to overcome the lack of market-supporting institutions in China. One of the most effective ways for them is to establish some relationships with the government to reduce the costs associated with market, state, and legal deficiencies. The extant literature has confirmed that political connections can be used as an alternative mechanism in China to protect a firm's property rights and interests from infringement by other market participants, and can help firms get access to bank loans on favorable terms, as well as tax preferences and government subsidies or contracts, all of which ultimately increase firms' market value or improve their economic performance (Allen, Qian, & Qian, 2005; Cheng, 2018; Fan, Rui, & Zhao, 2008; Wu, Wu, & Rui, 2010; Xu & Yano, 2017; Zhang, Marquis, & Qiao, 2016).

In general, there are mainly three ways for firms to establish a political relationship with the government in China. First, the CEO, senior executive or member of the board of directors once worked for the government agencies, which is referred to as ascribed bureaucratic connection. Previous government working experience endows them with unique information about government bureaucracy and operation, a channel of communication and access to existing local government leaders due to their common language, shared experience, and networked relationships (Zhang et al., 2016). Second, the CEO, senior executive or member of the board of directors served as a delegate to People's Congress (PC) or Chinese People's Political Consultative Conference (CPPCC), which can be described as achieved political connection.<sup>4</sup> As political “outsiders,” the senior executives gain political connections through efforts and achievements. Only when firms become large and executives become successful is it possible for these executives to be appointed to these political bodies. PC or CPPCC delegates have a good chance of getting in touch with incumbent government officials, especially during the National People's Congress, to express what they need and seek benefits for their firms. Last but not least, a firm can establish a political connection with the government by directly hiring a politically connected person, like a government official. As a bridge linking firms and the government, government officials help firms obtain variable government-related benefits by employing their political power and social networks (Cheng, 2018). According to the China Stock Market and Accounting Research (CSMAR) database, about 68.4% of the Chinese listed firms had some political connections in 2015, which shows that political connections are indeed a common phenomenon.

At the same time, China has maintained high-speed economic development since it implemented the “reform and opening-up” policy in 1978. One significant reason is that China has an advantage of cheap labor. This “demographic dividend,” as it is often called, has long been considered an important aspect of China's remarkable economic performance (Cheng & Lei, 2015). But, as the “demographic dividend” gradually disappears, China has been urged to change its development strategy from by relying on its labor advantage to by supporting technological innovation and enhancing the technological content of its products. Therefore, corporate innovation plays a key role during the process of transition. China would benefit from a transition from a “Made in China” economy to an “Innovated in China” economy. During the economic transition, however, Chinese firms lack strong incentives to innovate, which leads to a low innovative ability of firms. This economic phenomenon can be explained by many factors such as lack of financial support or imperfection of intellectual property protection.

### 2.2. Hypothesis development

Due to the universality of political connections and the importance of corporate innovation, it is practically significant to study the effects of political connections on corporate innovation in China. From the extant literature, the empirical evidence on the effect of political connections on the innovative performance of firms is mixed. Some studies found that political connections contribute to firm's innovation (Brogaard et al., 2015; Cumming et al., 2016; Kim et al., 2016; Ovtchinnikov et al., 2015). Given the uncertain nature of innovation activities, political connections help firms reduce future political uncertainties, enjoy favorable treatment, and therefore promote corporate innovation. For example, Kim et al. (2016) found that political connections are associated with

<sup>4</sup> The People's Congress (PC) is the China's legislature and the highest organ of state power in China. The Chinese People's Political Consultative Conference (CPPCC) is an advisory body to the party and government, analogous to an advisory legislative upper house in U.S. The main responsibilities of the CPPCC members are to hold political consultations and to exercise democratic supervision of the party and government.

significantly higher corporate innovation productivity regarding both innovation quantity and innovation quality as measured by patent awards and patent citations respectively.

Other studies, however, maintained that political connections have negative effects on the firm's innovative performance (Cheng, 2017; Kim, 2017; Shu et al., 2012; Xu & Yano, 2017). For instance, using a simple two-period incumbent-entrant model with positive entry cost, Kim (2017) have shown that the use of political connections by the incumbent as a barrier to entry implies a clear substitution effect between a firm's investment in political connections and its investment in physical capital and innovation. In transitional countries like China, an incumbent firm can either conduct innovative activities to maintain sufficiently low residual demand for the goods produced by an entrant or employ its political connections to obtain various economic benefits and thus maintain high barriers to entry. Due to the highly risky and uncertain nature of innovative activities, politically connected firms may not have enough incentive to make a heavy investment in innovation if high entry barriers formed by political connections already make market entry unprofitable for a potential entrant.

Through the careful analysis of the literature above, it is not difficult to observe that those studies which found the positive effect of political connections on corporate innovation usually used firm data in developed countries. In particular, Brogaard et al. (2015), Ovtchinnikov et al. (2015) and Kim et al. (2016) all have used firm data in the United States. Meanwhile, most studies that found the negative effect of political connections on corporate innovation employed firm data in developing countries like China (Cheng, 2017; Shu et al., 2012; Xu & Yano, 2017). One of the striking differences of firms between developed and developing countries is the innovative spirit of the firm's entrepreneur. Specifically, entrepreneurs in developing countries often lack the spirit of innovation, compared to their counterparts in developed countries. This observation provides a possible explanation for the mixed evidence on the effects of political connections on corporate innovation.

Schumpeter (1934), in his well-known study, likens the entrepreneur to the innovator in that the task of both of these economic players is to introduce new inventions into productive activity. So innovations by entrepreneurs tip the balance in the economy and lead to a process of creative destruction, via which firms that do not adopt the new technologies disappear. An innovative entrepreneur places great emphasis on product or service innovation to satisfy or create new demand, thereby gaining market share and profits. Therefore, the innovative spirit is closely related to innovative activities. In this context, an entrepreneur with a strong spirit of innovation is more likely to conduct innovative behaviors after the firm establishes political connections which bring economic benefits to it. In contrast, a conservative entrepreneur is probably inclined to invest low-risk or safe projects, like fixed asset investment, even if political ties can help them obtain various economic benefits and relax financial constraints (Boubakri, Cosset, & Saffar, 2008; Cheng, 2017; Xu, Xu, & Yuan, 2013).

Based on this analysis, we hypothesize that one of the important reasons why the extant literature arrived at the contradictory conclusion is that they neglected to consider the role that the spirit of innovation plays in the relationship between political connections and corporate innovation. If we take the innovative spirit into account, as analyzed before, politically connected firms with innovative entrepreneurs will make more investment in innovation because innovative entrepreneurs place great emphasis on product or service innovation. Using the unique matched employer-employee survey data, we construct an index measuring the innovative spirit of a firm's entrepreneurs and attempt to reconcile the mixed effects of political connections on corporate innovation.

### 3. Research design

#### 3.1. Data source

This study uses a three-year matched employer-employee sample focusing on Chinese manufacturing firms from 2013 to 2015. It was obtained from the China Employer and Employee Survey (CEES) which was conducted by Wuhan University in conjunction with Hong Kong University of Science and Technology, Tsinghua University, and the Chinese Academy of Social Science.<sup>5</sup> The CEES selected Guangdong province (in 2015) and Hubei province (in 2016) as sampling areas. Guangdong is located in eastern coastal China and is one of the most developed provinces in China, while Hubei is located in Central China and is a moderately developed province.<sup>6</sup> The reason for choosing these two provinces is to guarantee the heterogeneity and the representation of all provinces in China. The sample was obtained as follows. First, the sampled firms were selected from the firms listed in Guangdong's and Hubei's third economic census. Second, 20 teams of enumerators were organized to visit the sampled firms which were located in 19 counties (or districts) across 13 cities in Guangdong province and 20 counties (or districts) across 13 cities in Hubei province, and to distribute the questionnaires. Within each county or district, we collected at least 25 manufacturing firms' information. We set the refusal rate as 30% and therefore select 36 manufacturing firms according to a weighted random sampling based on the number of workers employed in the third economic census. Third, using stratified random sampling, six to ten employees of each firm were asked to fill out questionnaires. Among them, approximately 30% of the sampled employees were middle or senior managers, and the rest of them were front-line workers.

<sup>5</sup> The matched datasets with firm performance and worker heterogeneity are rarely available today (Yu, 2017). Indeed, only a few small rich countries such as Denmark have such an employer-employee survey dataset. The China Economic Journal published a special issue (including seven papers) to introduce and promote the CEES dataset in 2017.

<sup>6</sup> For Guangdong province, we sent our enumerators to visit the sampled firms in 2015. In the firm questionnaire, we asked respondents to fill in various financial indexes in 2013 and 2014. In 2016, we sent our enumerators to visit the sampled firms again and asked respondents to fill in various financial indexes in 2015.

The survey includes two parts: firm questionnaire and worker questionnaire. The former covers comprehensive information about the firms, including sections on basic information (e.g., name, registered year, registered type and location), production and sales conditions, R&D and innovation, quality competitiveness, and human resources, etc.<sup>7</sup> The latter contains extensive detailed information about the employees (e.g., middle or senior managers, other administrative staff, technical and design personnel, sales personnel, and frontline workers), such as demographic information (sex, age, education), as well as information on wages and bonuses, work history, disaggregated skills, specific human capital investment (such as vocational training), and social welfare etc. Besides, the worker questionnaire is the first survey to collect the employee's trait of character according to the Big Five personality classification method. Specifically, in the last section of the worker questionnaire, there are 44 questions to describe the employee's traits of character, which can be categorized as Big Five traits: *Conscientiousness*, *Agreeableness*, *Neuroticism*, *Openness to experience*, and *Extraversion*. Appendix A lists all these 44 questions. Following the extant literature, we use *Openness to experience* to construct an index measuring the innovative spirit (George & Zhou, 2001; Stock, Hippel, & Gillert, 2016; Zhao & Seibert, 2006). Originally, we collect a sample of 1208 firms and 10,887 employees.

Then we match the firm's financial information and the employee's demographic information. We only focus on the firm's middle or senior managers, most of whom are general manager, deputy chairman, and department manager, etc. Our sample shows that 74.8% of the middle or senior managers have some influences on the firm's significant investment decision. In particular, 14% of all middle or senior managers are directly in charge of R&D investment. Therefore, the personality traits of the middle or senior managers exert influence on the firm's R&D investment decision. For example, if a firm's middle or senior manager has a strong spirit of innovation, then he or she probably suggests conducting more innovative activities when making investment decisions. As for political connections, we collect the information on whether the middle or senior managers once had work experience in the government agencies or whether they have a political identity. Combined personality traits of the managers with their political connections, we are in a good position to study the relationship among political connections, innovation, and innovative spirit. We finally get a sample of 3579 firm-year observations.

### 3.2. Definitions of key variables

#### 3.2.1. Firm's innovation (*Lrd*)

Most empirical studies of corporate innovation measure innovations in one of two ways. One approach is to measure inputs for innovations, such as the number of R&D expenditures or the number of R&D employees (Adhikari & Agrawal, 2016; Aghion, Van, & Zingales, 2013; Chen, Leung, & Evans, 2016; Mukherjee, Singh, & Zaldokas, 2017). The obvious drawback of input-based measures is that the increase in R&D expenditure doesn't necessarily mean that the firm becomes more innovative, especially considering that government policies may drive the increase. The other approach is to measure innovation outputs, such as the number of patents applied for or granted, or patent citations (Kim et al., 2016; Ovtchinnikov et al., 2015; Zhu & Zhu, 2017). But the patent-based metrics have certain limitations as well because whether a firm decides to apply for a patent or use trade secrets to protect intellectual property, or chooses not to apply for a patent at all, are affected by many factors. For example, Lei, Sun, and Wright (2017) found that some patent applications may be driven by the yearly quotas set by the local government in China and therefore firms probably shift patent applications from the following year to previous November and December to meet the quota. In other words, the fact that a given firm has no patent application does not mean that it is not innovative; it may successfully invent new products without applying for patents. Moreover, the number of patent application is mainly the long-term innovation output and unable to reflect the short-term effects of establishing political connections on corporate innovation. Considering the advantages and disadvantages of each indicator and the availability of data, we use R&D investment to measure the firm's innovative activities. In the empirical part, we take its logarithm (*Lrd*) for the clear explanation.

#### 3.2.2. Political connectedness (*Polcon*)

Measurement of political connections is a challenge. In prior studies, most papers assumed that a firm has political connections if one of its large shareholders or senior executives once worked (or currently works) for the government agencies (Acemoglu et al., 2016; Faccio, 2006; Fisman, 2001; Kim et al., 2016; Zhang et al., 2016). As mentioned before, there are mainly three ways for firms to establish a political relationship with the government in China. (1) The CEO, senior executive or member of the board of directors once worked for the government, which is referred to as ascribed bureaucratic connection. (2) The CEO, senior executive or member of the board of directors served as a delegate to the PC or CPPCC, which can be described as achieved political connection. (3) A firm also can establish a political connection with the government by directly hiring a politically connected person, like a government official. Although the third way is the fastest and most efficient way to establish a relationship with the government in China (Cheng, 2018), the CEES only collected information on the political identity of the sampled employees and whether they once worked in the government agencies. Therefore, we assume that a firm has political connections if its middle or senior manager once worked in the government agencies or if he or she has a political identity, like obtaining membership in the PC or CPPCC.<sup>8</sup> We use *Polcon* to denote

<sup>7</sup> It should be noted that some variables we use for regression (e.g. sales revenues) may have measurement errors because they are retrospective. To alleviate this issue, enumerators required the senior manager who knows the firm well to fill out the firm questionnaire.

<sup>8</sup> Some may argue that the political connections of the firm's CEO or owner might be a more important determinant of the firm's political connections. But we think that the manager's political connections are also a good measure of the firm's political connections. First, in our definition of middle or senior managers, general manager, deputy general manager, and deputy chairman are senior executives or member of the board of



political connectedness, which is equal to one if the firm has at least one kind of political connections.

According to this definition, our sample has 180 politically connected firms which account for 15% of all firms. This ratio is much smaller than that of Fan, Wong, and Zhang (2007) (26.7%), Wu et al. (2010) (36.9%), and Zhang et al. (2016) (33%), all of which have drawn samples from Chinese listed firms to analyze the effects of political connections on firm's economic performance. In reality, it is not uncommon for listed firms to establish political connections in China where, however, listed firms only account for a small proportion of all enterprises. Therefore, the sampled listed firms in those papers are not representative of all enterprises in China. Different from them, this paper uses a sample of small and medium-sized firms (mainly non-listed). According to the National Bureau of Statistics, there are more than 50 million Chinese firms, and small and medium-sized firms accounted for about 95% in 2015. Therefore, our sample is more reliable and can truly reflect the status quo of Chinese manufacturing enterprises.

### 3.2.3. Innovative spirit (*Innovtrait*)

Innovative spirit is one of the key elements of entrepreneurship (Zhao, 2005). In the past literature, most papers often construct proxy variables to measure innovative spirit of an entrepreneur indirectly. For example, Wong et al. (2005) used the number of patents or inventions to measure the innovative spirit of an entrepreneur. To accurately and directly measure the spirit of innovation, this study draws on Big Five personality model which identifies a small number of meaningful traits in personality that display minimal overlap and provide meaningful measures for studying individual differences (McCrae & Costa, 1997). In the model, people are assumed to have trans-contextual personality dispositions which are highly stable over time, situations, and social roles. Although the adequacy of the Big Five personality model has been debated, an impressive body of literature has accumulated providing compelling evidence of its robustness (McCrae & Costa, 1985, 1987; McCrae & John, 1992).

As shown in Appendix A, there are 44 questions. Employees were asked to circle the number (from 1 to 5) that suits them best. The larger the number is, the more they agree with the opinion. Based on the Big Five personality model, these questions can be divided into five categories. The personality descriptions associated with each of the Big Five traits are as follows: *Conscientiousness*, *Agreeableness*, *Neuroticism*, *Openness to experience*, and *Extraversion*. In particular, *Openness to experience*, characterizing someone who is intellectually curious and trends to seek new experiences and explore novel ideas, is closely related to innovative spirit.<sup>9</sup> There are ten questions to describe *Openness to experience*. For example, the respondents were asked whether they see themselves as someone who “is original and comes up with new ideas,” “has an active imagination,” and “is inventive,” etc. To some extent, individuals with a high degree of *Openness to experience* can be described as creative, imaginative, curious, and untraditional (McCrae & Costa, 1985). In contrast, individuals with a low degree of *Openness to experience* can be characterized as traditional, narrow in interests, unadventurous, and unanalytical (McCrae & Costa, 1987).

Based on this kind of personality, we construct an index to measure the spirit of innovation of the middle or senior manager. Considering that we want to investigate whether the spirit of innovation plays a key role in the relationship between political connections and corporate innovation, we construct a dummy variable *Innovtrait* which takes a value of one if the middle or senior manager has a strong spirit of innovation. First of all, we calculate each respondent's composite score which is equal to the arithmetic mean of scores of ten questions, as shown in Online Appendix A. Then, *Innovtrait* takes a value of one if a respondent's composite score is greater than the mean of the composite score.<sup>10</sup> Since the higher composite score means that the middle or senior manager is more innovative, he or she has the stronger spirit of innovation if the variable *Innovtrait* is equal to one than those whose *Innovtrait* is equal to zero. By doing so, we can easily interpret the economic implication of the coefficient of *Innovtrait*.<sup>11</sup> In the empirical part, we construct an interaction term between *Polcon* and *Innovtrait* to investigate how the innovative spirit affects the causality relationship between political connections and corporate innovation. We also construct other indexes to measure the spirit of innovation for robustness checks.

### 3.2.4. Control variables

To control the possible effects of other variables on the firm's R&D expenditure, we include four categories of variables as controls (Cheng & Lei, 2015; Kim et al., 2016; Zhang et al., 2016). The first category is the firm's main characteristics, including firm size (*Lasset*), sales revenue (*Lrevenue*), firm age (*Firm\_age*), and share concentration (*Shareholding*). Second, we control for characteristics of the firm's middle or senior manager since different leadership types may affect corporate innovation. They are manager's age (*Manager\_age*), educational attainment (*EDU*), whether he or she joined Communist Party of China (*CPC*), and whether he or she has ever studies abroad (*Oversea*). Third, we also include other firm's dummy variables. They are whether the firm has a board of directors (*Board*), whether the firm is state-owned (*Stateowned*), and whether the firm is located in High-tech Development Zones

(footnote continued)

directors. They account for almost one-third of middle or senior managers in our sample. Second, politically connected CEO or owner indeed tends to hire a politically connected manager (Cheng, 2018; Fan et al., 2007).

<sup>9</sup> *Conscientiousness* indicates an individual's degree of organization, persistence, hard work, and motivation in the pursuit of goal accomplishment. *Agreeableness* describes an individual's interpersonal orientation, involving the tendency to prefer positive interpersonal relationships and cooperation. *Neuroticism* represents the tendency to exhibit poor emotional adjustment and experience negative effects, such as anxiety, insecurity, and hostility. *Extraversion* describes the extent to which people are assertive, dominant, energetic, active, talkative, and enthusiastic (Stock et al., 2016).

<sup>10</sup> Originally, we directly used composite score to measure the spirit of innovation. Although we can arrive at a similar conclusion, the coefficient of the variable that we are interested in does not have clear economic implication.

<sup>11</sup> For example, if the coefficient of *Innovtrait* is  $b$ , then the firm will increase R&D expenditure by  $100b\%$  if its middle or senior manager has a strong spirit of innovation (i.e.,  $Innovtrait = 1$ ).

**Table 1**  
Definitions of key variables.

| Variables                 | Definition  |
|---------------------------|---|
| <i>Lrd</i>                | log (R&D investment + 1)  |
| <i>Polcon</i>             | = 1 if the middle or senior manager once worked in the government agency or has a political identity    |
| <i>Polcon<sub>1</sub></i> | = 1 if the middle or senior manager once worked in the government agency                                |
| <i>Polcon<sub>2</sub></i> | = 1 if the middle or senior manager has a political identity  |
| <i>Innovtrait</i>         | = 1 if the middle or senior manager is more innovative (i.e., having the stronger spirit of innovation) |
| <i>Lasset</i>             | log (Total assets)  |
| <i>Lrevenue</i>           | log (Sales revenues)  |
| <i>Firm_age</i>           | Firm's age  |
| <i>Shareholding</i>       | Percentage of share held by the leader or boss of the firm  |
| <i>Manager_age</i>        | Middle or senior manager's age  |
| <i>EDU</i>                | = 1 if the middle or senior manager got a master degree   |
| <i>CPC</i>                | = 1 if the middle or senior manager joined the Communist Party of China (CPC)                           |
| <i>Oversea</i>            | = 1 if the middle or senior manager has ever studied abroad   |
| <i>Board</i>              | = 1 if the firm has a board of directors  |
| <i>Stateowned</i>         | = 1 if the firm is a state-owned enterprise   |
| <i>Hightechzone</i>       | = 1 if the firm is located in High-tech Development Zones   |
| <i>Taxrate</i>            | (Total taxes)/(Sales revenues)  |
| <i>Taxcut</i>             | = 1 if the firm enjoys tax reduction  |
| <i>Subsidy</i>            | = 1 if the firm gets a financial subsidy  |
| <i>Innov_subsidy</i>      | = 1 if the firm gets technological innovation subsidy   |
| <i>Lfixedasset</i>        | log (Fixed asset investment + 1)  |
| <i>Lentertain</i>         | log (Entertainment expenditure + 1)   |

(*Hightechzone*). Last, we control for the firm's industry (*Industry*), city (*City*) and year dummies (*Year*). The definitions and statistical description of these variables are shown in [Tables 1 and 2](#).

Online Appendix B reports the differences in the means of key variables between firms with and without political connections, and between firms whose middle or senior managers have a strong and weak spirit of innovation. First, while firms make more R&D investment if their middle or senior managers have a strong spirit of innovation, politically connected firms are inclined to make less R&D investment. Second, the middle or senior managers in the firms with and without political connections are not significantly different regarding the innovative spirit. At the same time, whether a firm establishes political connections with the government has nothing to do with the innovative spirit of its middle or senior manager. These two observations indicate that our sample is indeed random and has no sample selection problem.

Additionally, the differences in the means of most control variables between firms with and without political connections are significant, which means that politically connected firms are systematically different from their counterparts in many aspects. When we subdivide the sample according to the innovative spirit, about half of the control variables are significantly different between the two subsamples. Online Appendix C further compares *Lrd*, *Polcon*, and *Innovtrait* between high- and low-tech industries, high and low

**Table 2**  
Statistical description of key variables.

| Variables                 | Number of Obs. | Mean   | Std. Dev. | Min   | Max    |
|---------------------------|----------------|--------|-----------|-------|--------|
| <i>Lrd</i>                | 3579           | 2.444  | 3.084     | 0     | 13.218 |
| <i>Polcon</i>             | 3579           | 0.151  | 0.358     | 0     | 1      |
| <i>Polcon<sub>1</sub></i> | 3579           | 0.101  | 0.301     | 0     | 1      |
| <i>Polcon<sub>2</sub></i> | 3579           | 0.056  | 0.230     | 0     | 1      |
| <i>Innovtrait</i>         | 3450           | 0.540  | 0.498     | 0     | 1      |
| <i>Lasset</i>             | 3285           | 8.664  | 2.139     | 2.178 | 16.548 |
| <i>Lrevenue</i>           | 3531           | 8.706  | 2.156     | 2.079 | 16.415 |
| <i>Firm_age</i>           | 3567           | 10.361 | 7.595     | 0     | 61     |
| <i>Shareholding</i>       | 3413           | 0.428  | 0.413     | 0     | 1      |
| <i>Manager_age</i>        | 3184           | 47.450 | 8.474     | 27    | 79     |
| <i>EDU</i>                | 3579           | 0.369  | 0.483     | 0     | 1      |
| <i>CPC</i>                | 3348           | 0.252  | 0.434     | 0     | 1      |
| <i>Oversea</i>            | 3579           | 0.015  | 0.122     | 0     | 1      |
| <i>Board</i>              | 3550           | 0.594  | 0.491     | 0     | 1      |
| <i>Stateowned</i>         | 3579           | 0.141  | 0.348     | 0     | 1      |
| <i>Hightechzone</i>       | 3579           | 0.069  | 0.253     | 0     | 1      |
| <i>Taxrate</i>            | 3523           | 0.048  | 0.069     | 0     | 0.782  |
| <i>Taxcut</i>             | 3579           | 0.184  | 0.388     | 0     | 1      |
| <i>Subsidy</i>            | 3579           | 0.280  | 0.449     | 0     | 1      |
| <i>Innov_subsidy</i>      | 3579           | 0.122  | 0.328     | 0     | 1      |
| <i>Lfixedasset</i>        | 3513           | 5.099  | 3.105     | 0     | 14.869 |
| <i>Lentertain</i>         | 3579           | 2.138  | 1.977     | 0     | 11.298 |

marketization degree, high and low financial constraint faced by firms, and high and low market competition. First, a firm is more innovative if it operates in high-tech industries, or is located in cities with high marketization degree, or faces lower financial constraint, or faces higher market competition, which is consistent with the extant literature. Second, a firm is more likely to establish political connections in low-tech industries or cities with interventionist governments and weak protection of property rights. Last, the difference in *Innovtrait* is highly significant in the classification according to market competition.

### 3.3. Identification strategies

In this paper, we empirically ask two questions: (1) Does a politically connected firm make more R&D investment if its manager has a strong spirit of innovation? (2) Why does the politically connected firm with innovative managers make more R&D investment? As for the first question, we regress the following model:

$$Lrd_{it} = \alpha + \beta X_{it} + \theta Polcon_{it} + \gamma Innovtrait_i + \delta Polcon_{it} \times Innovtrait_i + \varepsilon_{it} \quad (1)$$

where subscript  $i$  refers to a specific firm and subscript  $t$  refers to a year. *Lrd* represents the R&D investment made by the firm. *Polcon* is a dummy variable which takes a value of one if the firm's middle or senior manager once worked in the government agencies or if he or she was elected as a PC or CPPCC member. *Innovtrait* is also a dummy variable and takes a value of one if the firm's middle or senior manager has a strong spirit of innovation. We construct an interaction term between *Polcon* and *Innovtrait* to investigate how the innovative spirit affects the causality relationship between political connections and corporate innovation. The coefficient of the interaction term,  $\delta$ , captures the effect of the innovative spirit on R&D investment made by politically connected firms. We predict that the sign of  $\delta$  is positive, which means that a politically connected firm makes more investment in R&D if its manager has a strong spirit of innovation. It should be noted that our analysis is limited by the fact that there is no variation in the innovativeness of the managers during 2013–2015, making it impossible to identify the effects of the innovative spirit on R&D investment from within-firm variation. Thus, in the results that follow, the effects of the innovative spirit on R&D investment are essentially identified from cross-sectional differences at the firm's level (Fisman & Wang, 2015). Control variables  $X$  include *Lasset*, *Lrevenue*, *Firm\_age*, *Shareholding*, *Manager\_age*, *EDU*, *CPC*, *Oversea*, *Board*, *Stateowned*, *Hightechzone*, *Industry* dummies, *City* dummies, and *Year* dummies. Since the dependent variable has many zero values, we use the Tobit model to conduct the following empirical analysis. Considering that firms are likely to be correlated within the industry, we estimate the clustered standard errors by industry to account for the dependence in the residual.

We answer the second question from the two aspects. First, we test whether politically connected firms obtain more economic benefits from the government, which to some extent can relax financial constraints. So we regress the following model:

$$Benefit_{it} = \alpha + \beta X_{it} + \theta Polcon_{it} + \varepsilon_{it} \quad (2)$$

where *Benefit* represents the economic benefits obtained by a firm. The extant literature has shown that political connections can help firms get access to bank loans on favorable terms, as well as tax preferences and government subsidies or contracts. Considering the availability of data, we use four variables to measure economic benefits: *Taxrate*, *Taxcut*, *Subsidy*, and *Inno\_subsidy*. The definitions and statistical description of these four variables are shown in Tables 1 and 2. As shown in Online Appendix B, politically connected firms indeed enjoy tax preference and more government subsidies. For example, the tax rate faced by politically connected firms is significantly lower than that of their counterparts. But there are no significant differences in these economic benefits between firms whose middle or senior managers have a strong and weak spirit of innovation, except for *Taxrate*.

Then, we investigate whether politically connected firms have an incentive to conduct low-risk projects, like fixed asset investment. If this is the case, resources will be diverted from innovative activities to fixed asset investment. Also, we want to check whether this incentive declines if the firm's middle or senior manager has a strong spirit of innovation. So we estimate the following model:

$$Lfixedasset_{it} = \alpha + \beta X_{it} + \theta Polcon_{it} + \gamma Innovtrait_i + \delta Polcon_{it} \times Innovtrait_i + \varepsilon_{it} \quad (3)$$

where *Lfixedasset* represents a firm's fixed asset investment. Other variables are the same as those in the model (1). We hypothesize that *Polcon* has a positive effect on the fixed asset investment, but the sign of  $\delta$  is negative.

## 4. Empirical results

### 4.1. Baseline results: effect of innovative spirit on the innovation of politically connected firms

Using the CEES data, we now regress the model (1). Table 3 reports the results. It can be seen that the coefficients of *Polcon* are always significantly negative as we gradually include additional control variables into the model, which indicates that political connections impede the innovation of small and medium-sized firms in China. Due to the Tobit model, we calculate the marginal effects in Online Appendix D. As shown in column (5) in Online Appendix D, the R&D investment decreases by 45% for a politically connected firm. In China where the legal system and market economy are imperfect, an incumbent firm can increase corporate innovation to maintain sufficiently low residual demand for the goods produced by an entrant, or it can use its political tie to obtain various economic benefits and thus maintain high barriers to entry. Which strategy a firm chooses depends, in most cases, on their relative costs (Cheng, 2017; Yang, 2011). Due to the high-risk and high-cost nature of innovation, establishing political connections is comparatively easy, especially considering that China traditionally puts a high value on social networks (Allen et al., 2005). After



**Table 3**  
Effects of political connections on the firm's innovation: Innovative Spirit.

| Variables                         | R&D Investment         |                        |                         |                        |                        |                        |
|-----------------------------------|------------------------|------------------------|-------------------------|------------------------|------------------------|------------------------|
|                                   | (1)                    | (2)                    | (3)                     | (4)                    | (5)                    | (6)                    |
| <i>Polcon</i>                     | −0.8663***<br>(0.2982) | −0.8332***<br>(0.3021) | −1.0639** (0.4211)      | −0.9391** (0.4208)     | −0.8685** (0.4202)     | −0.8597** (0.4201)     |
| <i>Innovtrait</i>                 |                        | 1.3162*** (0.2026)     | 1.0153*** (0.2038)      | 1.0893*** (0.2063)     | 1.1950*** (0.2079)     | 1.1855*** (0.2083)     |
| <i>Polcon</i> × <i>Innovtrait</i> |                        |                        | 1.6038*** (0.5390)      | 1.7695*** (0.5431)     | 1.6314*** (0.5431)     | 1.6256*** (0.5430)     |
| <i>Lasset</i>                     |                        |                        | 0.7537*** (0.0840)      | 0.7521*** (0.0848)     | 0.6603*** (0.0874)     | 0.6573*** (0.0875)     |
| <i>Lrevenue</i>                   |                        |                        | 0.2184** (0.0854)       | 0.1840** (0.0862)      | 0.1951** (0.0875)      | 0.1977** (0.0875)      |
| <i>Firm_age</i>                   |                        |                        | 0.0332** (0.0138)       | 0.0370*** (0.0142)     | 0.0364** (0.0146)      | 0.0364** (0.0146)      |
| <i>Shareholding</i>               |                        |                        | 0.5142** (0.2586)       | 0.6089** (0.2654)      | 0.7511*** (0.2718)     | 0.7491*** (0.2717)     |
| <i>Manager_age</i>                |                        |                        |                         | −0.0300** (0.0116)     | −0.0330***<br>(0.0117) | −0.0325***<br>(0.0117) |
| <i>EDU</i>                        |                        |                        |                         | 0.7148*** (0.2171)     | 0.6205*** (0.2183)     | 0.6251*** (0.2183)     |
| <i>CPC</i>                        |                        |                        |                         | 0.4669 (0.3279)        | 0.4725 (0.3313)        | 0.4768** (0.2313)      |
| <i>Oversea</i>                    |                        |                        |                         | −0.1364 (0.7742)       | −0.0242 (0.7719)       | −0.0192 (0.7716)       |
| <i>Board</i>                      |                        |                        |                         |                        | 0.4300** (0.2175)      | 0.4281** (0.2174)      |
| <i>Stateowned</i>                 |                        |                        |                         |                        | 0.2449** (0.1083)      | 0.2360 (0.3085)        |
| <i>Hightechzone</i>               |                        |                        |                         |                        | 1.5063*** (0.3917)     | 1.4975*** (0.3917)     |
| <i>Innovtrait_all</i>             |                        |                        |                         |                        |                        | 0.1512** (0.0704)      |
| <i>Constant</i>                   | −4.3874***<br>(1.0684) | −4.8352***<br>(1.1169) | −11.7825***<br>(1.1535) | −9.8844***<br>(1.2440) | −9.2952***<br>(1.2499) | −9.3550***<br>(1.2530) |
| <i>Industry</i>                   | Yes                    | Yes                    | Yes                     | Yes                    | Yes                    | Yes                    |
| <i>City</i>                       | Yes                    | Yes                    | Yes                     | Yes                    | Yes                    | Yes                    |
| <i>Year</i>                       | Yes                    | Yes                    | Yes                     | Yes                    | Yes                    | Yes                    |
| <i>F statistic</i>                |                        |                        | 4.81**                  | 5.60***                | 5.09**                 | 4.42**                 |
| Number of Obs.                    | 3558                   | 3429                   | 3039                    | 2911                   | 2896                   | 2896                   |

Note: Robust standard errors clustered at industry level are in parentheses. Asterisks indicate statistical significance at 1% \*\*\*, 5% \*\*, and 10% \* levels. The null hypothesis of *F statistic* is that the sum of the coefficients of *Polcon* and *Polcon* × *Innovtrait* is equal to zero.

obtaining political connections, firms can easily get various economic benefits and legal protection from the government. Therefore, politically connected firms do not have strong incentive to make additional investments in innovation because high entry barriers formed by political connections already make market entry unprofitable for potential entrants.

Then we check the effect of *Innovtrait* on the firm's innovation. Consistent with our analysis, *Innovtrait* has a significantly positive effect on R&D investment. That is, a middle or senior manager with strong innovative spirit places great emphasis on technological innovation by increasing R&D investment. Moreover, the coefficients of the interaction term, *Polcon* × *Innovtrait*, are also highly significant and positive, as shown in columns (3)–(5) of Table 3. What's more important, its magnitude is greater than that of *Polcon*, which indicates that the total effect of political connections on R&D investment is positive when the firm's manager has a strong spirit of innovation. Take the column (5) in Online Appendix D for example. The R&D investment instead increases by 36% if the politically connected firm has an innovative manager. We also report *F statistic* of joint significance test of *Polcon* and *Polcon* × *Innovtrait* in Table 3 to examine whether the innovative spirit merely offsets the negative effect of *Polcon* on R&D investment. We reject the null hypothesis at 5% level in all models.

The key elements of entrepreneurship include risk-taking, proactivity, and innovation. The innovative spirit of the firm's entrepreneur seemingly reduces the cost of innovation, compared to the cost of establishing political connections. In other words, politically connected firms with innovative entrepreneurs are inclined to maintain high entry costs by investing in innovation to reduce residual demand for the goods produced by an entrant. In this context, we conclude that political connections contribute to the firm's innovative activities.

To sum up, the effects of political connections on corporate innovation indeed depend on whether the entrepreneur has a strong spirit of innovation. By including an index measuring innovative spirit and its interaction term with political connections, we succeed in resolving this seemingly contradictory economic phenomenon. So this paper provides a possible explanation for the mixed effects of political connections on corporate innovation.

We can also briefly explain the economic implications of control variables. Take the column (5) of Table 3 for example. A firm makes more R&D investment if it is state-owned, a larger enterprise with more sales revenue, operating in the longer period, having a board of directors, located in High-tech Development Zones, or the boss of the firm holds a larger percentage of share. Since most firms in our sample are small and medium-sized non-listed enterprises, the financial constraint is binding. So state-owned firms can get various economic benefits due to the government paternalistic care and therefore make more R&D investment. Moreover, the firms are more innovative if their middle or senior managers are younger, or they received a master degree. But, the party membership and oversea experience have no significant effects on the firm's R&D investment. Possible reasons are that party membership only reflects political enthusiasm and the number of middle or senior managers with overseas experience is small. Hereafter, we omit to report the coefficients of control variables for brevity, although we always include all control variables.

**Table 4**  
Further discussion of baseline results.

| Variables                       | Panel A: Endogeneity problem of Political connections |                    |                    |                    |                    | Panel B: Sample selection bias |                    |
|---------------------------------|---|--------------------|--------------------|--------------------|--------------------|--------------------------------|--------------------|
|                                 | Reverse causality                                     |                    | Omitted variables  |                    |                    | First-step                     | Second-step        |
|                                 | (1)   | (2)                | (3)                | (4)                | (5)                | (1)                            | (2)                |
| <i>lag(Polcon)</i>              | -1.0542** (0.5325)                                    |                    |                    |                    |                    |                                |                    |
| <i>lag(Polcon) × Innovtrait</i> | 1.8570*** (0.6863)                                    |                    |                    |                    |                    |                                |                    |
| <i>Polcon</i>                   |   |                    |                    |                    |                    |                                |                    |
| <i>Polcon × Innovtrait</i>      |   |                    |                    |                    |                    |                                |                    |
| <i>Innovtrait</i>               | 1.2642*** (0.2622)                                    | -0.8901** (0.4229) | -0.9347** (0.4313) | -0.8353* (0.4347)  | -0.7853 (0.4371)   | -0.2360* (0.1389)              | -0.9198** (0.4027) |
| <i>Extraversion</i>             |   | 1.1511*** (0.4215) | 1.0859** (0.4326)  | 1.0124** (0.4338)  | 1.0320** (0.4368)  | 0.3171* (0.1812)               | 1.1233** (0.5587)  |
| <i>Agreeableness</i>            |   | 1.5804*** (0.5467) | 1.6376*** (0.5539) | 1.7384*** (0.5609) | 1.7442*** (0.5649) | 0.3296*** (0.0760)             | 0.0354 (0.1150)    |
| <i>Conscientiousness</i>        |   | 0.0880 (0.2090)    | 0.0719 (0.2172)    | 0.0528 (0.2191)    | 0.0401 (0.2246)    | 0.0228 (0.0711)                | -0.1371 (0.1009)   |
| <i>Neuroticism</i>              |   |                    | 0.3436 (0.2132)    | 0.1851 (0.2173)    | 0.1495 (0.2247)    | 0.0088 (0.0713)                | 0.1126 (0.1012)    |
| <i>RD_department</i>            |   |                    |                    | 0.7021*** (0.2060) | 0.6575** (0.2077)  | 0.1111* (0.0658)               | 0.2656** (0.0959)  |
| <i>Mills ratio</i>              |   |                    |                    |                    | -0.0104 (0.2145)   | 0.4910*** (0.1506)             | -0.0346 (0.0930)   |
| <i>Control variables</i>        | Yes   | Yes                | Yes                | Yes                | Yes                | Yes                            | 0.2162 (0.3347)    |
| <i>F statistic</i>              | 3.07*   | 3.81**             | 3.68*              | 5.86***            | 6.49***            | 3.13*                          | Yes                |
| <i>Number of Obs.</i>           | 1935  | 2851               | 2794               | 2737               | 2707               | 2704                           | 4.64**             |
|                                 |   |                    |                    |                    |                    |                                | 1420               |

Note: We omit to report the coefficients of control variables for brevity. Robust standard errors clustered at industry level are in parentheses. Asterisks indicate statistical significance at 1% \*\*\*, 5% \*\*, and 10% \* levels. The null hypothesis of *F statistic* is that the sum of the coefficients of *Polcon* and *Polcon × Innovtrait* is equal to zero.

## 4.2. Further discussion of baseline results

### 4.2.1. Solving the endogeneity problem of political connections

While the baseline results support our hypothesis that politically connected firms with innovative managers make more R&D investment, the endogeneity problem of political connections is a potential concern (Cheng, 2018; Kim, 2017; Zhang et al., 2016). There may exist reverse causality between the establishment of political connections and corporate innovation. On the one hand, political connections can help a firm obtain economic benefits and thus affect its innovation. On the other hand, a firm with a strong ability of innovation usually has good economic performance, and therefore its manager is more likely to obtain political identity. Omitted variables can also induce endogeneity; it is plausible that unobservables such as business acumen are correlated with the ability to establish political connections.

Based on the information the CEES provides, we can alleviate the endogeneity problem of political connections using two approaches. First, we use the lagged value of political connections to alleviate the endogeneity problem caused by reverse causality. By definition, a firm has political connections if its middle or senior manager once worked in the government agencies or if the manager has a political identity, like membership in PC or CPPCC. Through observation, we find that a large proportion of firms in our sample established political connections before 2013. For instance, all delegates to the PC or CPPCC was elected before 2013. Under these circumstances, the endogeneity problem caused by reverse causality is not serious because our research period is from 2013 to 2015. But we still employ lag identification to check the robustness of baseline results. The empirical results are shown in Panel A of Table 4. As shown in column (1) of Panel A,  $Polcon_{it-1}$  has a negative effect on R&D investment while  $Innovtrait$  has a positive effect on it. Moreover, the magnitude of the coefficient of the interaction term is still greater than that of  $Polcon_{it-1}$ , which is consistent with the baseline result.

Second, we use proxy variables to measure omitted variables that may also give rise to the endogeneity problem. Since both establishing political connections and conducting innovative activities might be related to the firm's entrepreneur's behavior, we may omit some personality traits of the entrepreneur that probably affect both of them at the same time. In other words, the baseline results we document may be due to these omitted personality traits. So we construct proxy variables to measure those omitted personality traits and add them to the model. According to the Big Five personality model, those five personality traits can reflect all characteristics of the entrepreneur.<sup>12</sup> We have already used *Openness to experience* to construct the index of innovative spirit. The other four personality traits more or less affect both the establishment of political connections and the firm's innovative performance.<sup>13</sup> Based on the same method as we did for *Innovtrait*, we construct four dummy variables to measure these four personality traits. Then we add them to the model one by one, and the results are shown in Panel A of Table 4.

As shown in columns (2)–(5) of Panel A, no matter which and how many personality traits are included in the model, our baseline results maintain almost unchanged. In particular, the magnitude of the coefficient of the interaction term is still greater than that of *Polcon* in all four columns. Therefore, the endogeneity problem caused by omitted variables is also not serious for our sample. As for four personality traits, only *Conscientiousness* is significantly positive. *Conscientiousness* indicates an individual's persistence, hard work, and motivation in the pursuit of goal accomplishment. Individuals with high scores on conscientiousness usually have a preference for planned and systematic rather than spontaneous behavior. Therefore, we find that a firm with a conscientious manager is inclined to make more R&D investment.

### 4.2.2. Solving the endogeneity problem of the innovative spirit

Some may also concern the endogeneity problem of the innovative spirit. For example, an innovative firm is more likely to hire an innovative manager. In this paper, we define the innovative spirit of a manager (*Innovtrait*) according to the Big Five personality model. There are ten questions to describe *Openness to experience* (used to construct *Innovtrait*). We don't think that every firm in our sample strictly follows these ten questions to hire an innovative manager, especially considering that our sample is comprised of small and medium-sized firms (mainly non-listed). It is highly possible that most firms do not exactly know the innovativeness of a manager. To verify this possibility, we simply compare the variable *Openness to experience* between high-tech and low-tech firms, as shown in Online Appendix E. Obviously, there is no significant difference in the variable *Openness to experience* between high-tech and low-tech firms. So the endogeneity problem of the manager's innovative spirit caused by reverse causality is not serious in our paper.

Moreover, some unobservable factors (e.g., unobserved “innovativeness” of a firm) may affect both the firm's innovative activities and the firm's hiring decision of innovative managers, causing the endogeneity problem of the manager's innovative spirit. We can use the innovativeness of all sampled employees (*Innovtrait\_all*) in a firm as a proxy for the unobserved “innovativeness” of the firm. Specifically, we first calculate each respondent's composite score which is equal to the arithmetic mean of scores of ten questions. Then we calculate the average composite score of all respondents (denoted as *Openness\_all*). *Innovtrait\_all* takes a value of one if a firm's *Openness\_all* is greater than the mean of the *Openness\_all*. Now, we add it to the model, and the result is shown in column (6) of

<sup>12</sup> For example, extraverts enjoy social activities and prefer being with others than being alone. Individuals with high scores on conscientiousness have a preference for planned and systematic rather than spontaneous behavior. Agreeable individuals are associated with being conforming to social conventions, compliant, trusting, forgiving, modest, soft-hearted, and tolerant, and have been shown to engage more in cooperative, higher quality interpersonal interactions. People who score high on neuroticism tend to be uptight and often express negative attitudes, and they have lower quality interactions with others in social situations (Stock et al., 2016).

<sup>13</sup> In the untabulated table, we indeed find that some personality traits (e.g., *Conscientiousness*) has a positive effect on the establishment of political connections.

**Table 3.** It is not difficult to find that the baseline results are still robust to the inclusion of *Innovtrait\_all*. Therefore, the omitted variable issue is also not serious.

#### 4.2.3. Correcting sample selection bias

In our sample, more than half of firms do not have R&D investment for some reasons, which may give rise to a sample selection problem. In reality, a firm first determines whether it carries on innovative activities and then the firm chooses the amount of investment in R&D. If these two processes are uncorrelated, then we can use a two-part model by estimating the two processes separately. But usually, it is more realistic to assume that a large error in explaining whether the firms innovate will be associated with a large error in explaining the amount of R&D investment. The common approach to correct sample selection bias is to employ a Heckman two-step model (Heckman, 1976). While the second-step regression is the same as the model (1), the first-step regression is a Probit model:

$$RD_{it} = \alpha + \beta X_{it} + \mu Four\_traits + \theta Polcon_{it} + \gamma Innovtrait_i + \delta Polcon_{it} \times Innovtrait_i + \varepsilon_{it} \quad (4)$$

where *RD* is a dummy variable representing the likelihood of conducting innovative activities. Since identification requires that there is at least one variable that is included in the model (4) not being included in the model (1), we assume that a firm's decision to innovate is affected by the fact that whether a firm sets an independent R&D department (denoted by *RD\_department*). But the establishment of an independent R&D department probably won't affect the amount of R&D investment. Panel B of Table 4 reports the results. A politically connected firm with an innovative manager not only has a high probability of conducting innovation but also decides to make more R&D investment, which is consistent with our baseline results. The insignificance of *Mills ratio* also indicates that the sample selection bias is not serious in our paper.

To sum up, after solving the endogeneity problems and correcting the sample selection bias, the baseline results are still robust. Now we can safely conclude that the innovative spirit of the firm's entrepreneur plays an important role in the relationship between political connections and corporate innovation. A politically connected firm makes more investment in R&D in China if the manager has a strong spirit of innovation.

#### 4.3. Heterogeneous effects of political connections on the firm's innovation

The extant literature has shown that entrepreneurship may play a different role in innovative activities of firms with different characteristics or the different economic environment (Huggins & Thompson, 2015; Soriano & Huarng, 2013). Now we test the heterogeneity of the roles of innovative spirit in the relationship between political connections and corporate innovation in the following four aspects.

First, in our sample, more than two-thirds of all sampled firms are defined as high-tech enterprises. Innovation is more crucial to the explorative type of firms (high-tech firms) than to the exploitive type of firms (low-tech firms) (Kim et al., 2016), which is confirmed in Panel A of Online Appendix C. On the contrary, political tie with the government may not be a key determinant of a firm's competitiveness, although it can bring various economic resources to the firm. Therefore, we posit that innovative spirit may play a greater role in high-tech firms than in low-tech firms. We construct a dummy variable *Hightech*, which takes a value of one if the firm is defined as a high-tech enterprise.<sup>14</sup> Second, several previous papers have documented that firms are less likely to establish political connections, and thus hardly be treated favorably, in areas with high degree of marketization (Cheng, 2018; Faccio, 2006; Zhang et al., 2016), which can be seen from Panel B of Online Appendix C. Moreover, the highly developed market economy places a high value on entrepreneurship. Therefore, the promoting effect of political connections on corporate innovation is more pronounced in areas with a higher degree of market economy. To test this hypothesis, we construct a dummy variable *Marketization*, which takes a value of one if the firm is located in Guangdong province and zero otherwise.<sup>15</sup>

Third, due to the highly risky and uncertain nature of innovation, it is notoriously difficult for innovative firms to access capital to fund R&D projects (Hedge & Mishra, 2014; Kim et al., 2016). Consequently, financial constraints present a serious challenge to technological innovations. Empirical evidence, however, suggests that politically connected firms have better access to capital compared to non-connected firms (Houston, Jiang, Lin, & Ma, 2014). As a result, we expect a positive effect of political connections on innovation among firms facing greater financial constraint after we include the spirit of innovation and its interaction term with political connections into the model. To empirically test this hypothesis, we employ firm's Interest Protection Multiples (*IPM*) to measure the degree of financing constraints. The *IPM* is defined as the ratio of earnings before interests and taxes to interests. It not only measures a firm's profitability but also reflects the firm's ability to pay back maturing debt. From the prior literature, many studies have used it to measure the degree of financing constraints (Bates, Kahle, & Stulz, 2009; Carpenter & Guariglia, 2008). Based on the *IPM*, we construct a dummy variable *Finconstraint*, which takes a value of one if *IPM* is less than one. A firm faces greater financial constraint if the variable *Finconstraint* is equal to one.

Last, firms operating in highly competitive industries typically face stiffer product market competition. To maintain competitive

<sup>14</sup> According to the *Chinese High-tech Industry Classification Catalog* (2002), high-tech industries mainly include the electronic and communication equipment manufacturing industry, computer industry, office equipment manufacturing industry, pharmaceutical industry, medical equipment manufacturing industry, and new materials industry. The enterprise is high-tech if it operates in such high-tech industries.

<sup>15</sup> Guangdong is located on the eastern coastal China and is one of most developed provinces in China. Guangdong province has a higher degree of marketization than Hubei province (Wang et al., 2017).

advantage and market share, firms in these industries need to conduct innovative activities constantly, which is confirmed in Panel D of Online Appendix C. In this context, the benefits from political connections are probably more valuable for such firms. To test this hypothesis, we construct a dummy variable *Competition*, which takes a value of one if the firm operates in competitive industries like the textile industry.<sup>16</sup>

Now we subdivide the whole sample according to those four factors and then regress the model (1) separately. The regression results are shown in Table 5. It can be seen that the results are consistent with our hypotheses mentioned above. Specifically, a politically connected firm with an innovative manager makes more investment in R&D, only when the firm is a high-tech enterprise, or it is located in areas with a higher degree of marketization, or it faces greater financial constraint, or it operates in highly competitive industries. Surprisingly, the coefficients of the interaction term are insignificant in all the reverse situations, such as facing smaller financial constraint. Therefore, the innovative spirit can play a key role that changes the effect of political connections on corporate innovation only in particular economic environments.

#### 4.4. Robustness checks

##### 4.4.1. Excluding some possibilities that may explain our baseline results

In reality, there are some characteristics of firms or managers that may explain the baseline results. First, we consider types of the firm's manager. Compared with middle managers, senior managers usually have a broader view and more experienced. Moreover, they have stronger administrative control power in the firm's investment decisions. It is highly possible that the innovative spirit can play a key role in the R&D investment decision only if the manager has such characteristics mentioned above. So we exclude those firms whose senior managers are interviewed and only focus on middle managers. Second, although there is only a small proportion of listed firm (1%) in the CEES, they are systematically different from non-listed firms. The innovative spirit probably works more effectively in listed firms which have standardized corporate governance (e.g., the board of directors system). So we exclude listed firm from the sample. Third, in our sample, a proportion of managers has an MBA degree. That means and they received systematic training in business management which endows them with an innovative spirit. Therefore, it is entirely possible that the knowledge of business management changes the effect of political connections on corporate innovation. To eliminate this possibility, we only focus on middle or senior managers without an MBA degree. Fourth, some firms have foreign shares (including Hong Kong, Macau, Taiwan). Since executives from abroad may have a different business philosophy that affects a firm's innovative strategies, we focus on domestic firms. Last, we exclude large-sized firms which are systematically different from small and medium-sized firms.

Now we use these five subsamples to regress the model (1) by excluding some firms with the characteristics mentioned above. The results are reported in Panel A of Online Appendix F. It is not difficult to find that the results are similar to baseline results after we eliminate those five possibilities. For example, a politically connected firm with an innovative middle manager increases its R&D investment.

##### 4.4.2. Constructing other indexes to measure the innovative spirit

We have constructed an innovative spirit based on *Openness to experience*. Now we construct other indexes to measure it. First, according to Appendix A, there are five options (from “1” extreme disagreement to “5” extreme agreement) to each trait of character. We change the critical value when defining the innovative spirit. That is, *Innovtrait<sub>1</sub>* takes a value of one if a respondent's composite score is greater than “3” which represents a neutral point of view. Second, conscientiousness indicates an individual's degree of organization, persistence, hard work, and motivation in the pursuit of goal accomplishment. As shown in Table 4, it has a positive effect on firm's innovation. So we also use it to measure the innovative spirit of the firm's manager (*Innovtrait<sub>2</sub>*).

Third, there are ten traits of character to describe *Openness to experience*. Since they are highly correlated, we employ the Principle Component Analysis (PCA) to reduce the number of variables and construct an index measuring the innovative spirit.<sup>17</sup> After calculating the eigenvalues of the correlation matrix, we keep the first six principal components which explain 78% of the total variance. Then we calculate the composite score with a zero mean value. Since a higher composite score means the manager is more innovative, we construct a dummy variable to measure the spirit of innovation. Specifically, *Innovtrait<sub>3</sub>* take a value of one if the composite score is greater than zero, which indicates that the middle or senior manager has a strong spirit of innovation.

Fourth, the CEES collects the middle or senior manager's risk propensity. Each manager was asked to choose a number between “0” and “10” to best describe his or her risk propensity. Here, “0” represents that you would never do anything risky, and “10” represents that you would love to take risks. Since innovation is a high-risk activity, risk preference to some extent can reflect the manager's innovative spirit. So we construct a dummy variable (*Innovtrait<sub>4</sub>*), which takes a value of one if the number they chose is greater the mean of risk propensity of all sampled employees. Besides, there is a choice question in the CEES. Assuming that the current interest rate is 0 and you neglect the price changes, do you prefer to receive 1000 yuan tomorrow or 1100 yuan after one year? This question refers to people's patience which is crucial for innovative activities. So we also use it to measure the manager's innovative spirit roughly. Specifically, we construct a dummy variable (*Innovtrait<sub>5</sub>*), which takes a value of one if the manager chose

<sup>16</sup> We define competitive industries as those in which the proportion of the state-owned economy is lower than 50%. Here, the proportion of the state-owned economy is the ratio of the number of state-owned and collective-owned enterprises to the total number of enterprises in an industry. In our sample, the competitive industries mainly include agricultural and sideline products industry, textile industry, computer industry, office equipment manufacturing industry, pharmaceutical industry, medical equipment manufacturing industry, etc.

<sup>17</sup> Both Bartlett test of sphericity and KMO test confirm that our sample is suitable for PCA.



**Table 5**  
Heterogenous effects of political connections on the firm's innovation.

| Variables                         | R&D Investment         |                       |                       |                       |                       |                       |                       |                       |
|-----------------------------------|------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|                                   | Technological level    |                       | Marketization degree  |                       | Financial constraint  |                       | Market competition    |                       |
|                                   | High-tech              | Low-tech              | High                  | Low                   | High                  | Low                   | High                  | Low                   |
|                                   | (1)                    | (2)                   | (3)                   | (4)                   | (5)                   | (6)                   | (7)                   | (8)                   |
| <i>Polcon</i>                     | -1.4662***<br>(0.5405) | -1.2270**<br>(0.6056) | -0.7051**<br>(0.3269) | -1.3770**<br>(0.6141) | -0.9011**<br>(0.4421) | -0.7852**<br>(0.3417) | -1.1735**<br>(0.4597) | -0.8175*<br>(0.4638)  |
| <i>Polcon</i> × <i>Innovtrait</i> | 2.4587***<br>(0.6899)  | 1.1923<br>(1.0077)    | 1.8383***<br>(0.6459) | 0.5258<br>(0.9345)    | 1.2752**<br>(0.5823)  | 0.9260<br>(0.6331)    | 2.6354***<br>(0.6209) | -1.0047<br>(0.6419)   |
| <i>Innovtrait</i>                 | 1.4255***<br>(0.3988)  | 1.8287***<br>(0.3868) | 1.2849***<br>(0.4160) | 1.0056***<br>(0.3102) | 0.8956***<br>(0.2500) | 1.8732***<br>(0.3991) | 0.6448**<br>(0.2613)  | 1.9217***<br>(0.5206) |
| <i>Control variables</i>          | Yes                    | Yes                   | Yes                   | Yes                   | Yes                   | Yes                   | Yes                   | Yes                   |
| <i>F statistic</i>                | 19.54***               | 1.80                  | 11.84***              | 3.45*                 | 7.66***               | 0.91                  | 11.05***              | 2.03                  |
| Number of Obs.                    | 1851                   | 856                   | 1205                  | 1502                  | 562                   | 2145                  | 2225                  | 482                   |

Note: We omit to report the coefficients of control variables for brevity. Robust standard errors clustered at industry level are in parentheses. Asterisks indicate statistical significance at 1% \*\*\*, 5% \*\*, and 10% \* levels. The null hypothesis of *F statistic* is that the sum of the coefficients of *Polcon* and *Polcon* × *Innovtrait* is equal to zero.

1100 yuan after one year.

Now we use these five indexes to measure innovative spirit and run the regression again. The results are reported in Panel B of Online Appendix F. Our baseline results are robust to different measurements of the innovative spirit.

#### 4.4.3. Using other measures of a firm's innovative activities

Last, we use the other five indexes to measure a firm's innovative activities. They are the ratio of R&D expenditure to sales revenue, whether applying for a patent, sales revenue of new products, expenditure of purchasing the domestic technology, and R&D expenditures paid for universities and government research institutions. They all reflect the firm's innovative activities from different aspects. It can be seen, from Panel C of Online Appendix F, that the baseline results are also robust to other measurements of the firm's innovation.

To sum up, after conducting three sets of robustness checks, the baseline results maintain almost unchanged, except for several slight changes in significance. We find that whether political connections contribute to or impede a firm's innovative activities indeed depends on the innovative spirit of the firm's entrepreneur. Our results show that a politically connected firm makes more investment in R&D if the firm's middle or senior manager has a strong spirit of innovation. In a nutshell, this paper provides a reasonable explanation for the mixed evidence on the effects of political connections on corporate innovation.

## 5. Further discussion

### 5.1. The reasons why the innovative spirit changes the effect of political connections on corporate innovation

We have proven that political connections contribute to corporate innovation when the firm's entrepreneur has a strong spirit of innovation. So what are the channels through which the innovative spirit has such an effect? In this section, we will answer this question from two aspects. First, we investigate whether politically connected firms enjoy favorable treatments from the government. Second, we discuss how politically connected firms use these resources.

#### 5.1.1. Effects of political connections on economic benefits obtained by firms

We use four variables to measure economic benefits: *Taxrate*, *Taxcut*, *Subsidy*, and *Inno\_subsidy*. The definitions and statistical description of these four variables are shown in Tables 1 and 2. The regression results are shown in Table 6. As shown in columns (1) and (4) in both Panels A and B, political connections indeed can help firms get tax preference and government subsidies. For example, the tax rate reduces by 0.8 percentage points for the politically connected firm. Given the mean of *Taxrate* in Table 2, the tax rate faced by politically connected firms reduces by 16.7%. The growing body of researches has documented that economic benefits contribute to the firm's innovative activities (Bryce Campodonico, Bonfatti, & Pisano, 2016; Mukherjee et al., 2017). As shown in column (2) of Table 8, the economic benefits indeed contribute to the firm's R&D investment.

But these results also may be biased due to the endogeneity problem of political connections. We use lagged value of political connections, as shown in columns (2) and (5), and add other four personality traits to the model, as shown in columns (3) and (6), to alleviate the endogeneity problem. The variable *Four\_traits* denotes those four personality traits (*Extraversion*, *Conscientiousness*, *Agreeableness*, and *Neuroticism*). Obviously, the results do not change much. It should be noted that the spirit of innovation only significantly affects the tax rate faced by firms, which is consistent with the reality. For some economic privileges like government subsidy, whether a firm has access to them mainly depends on the government's decision. In summary, consistent with the extant literature, we empirically find that politically connected firms can get various economic benefits from the government.

**Table 6**  
Effects of political connections on economic benefits.

| Variables                | Panel A: Tax preference     |                     |                     |                   |                  |                   |
|--------------------------|-----------------------------|---------------------|---------------------|-------------------|------------------|-------------------|
|                          | Taxrate                     |                     |                     | Taxcut            |                  |                   |
|                          | (1)                         | (2)                 | (3)                 | (4)               | (5)              | (6)               |
| <i>Polcon</i>            | −0.0080* (0.0047)           |                     | −0.0084* (0.0050)   | 0.0658** (0.0270) |                  | 0.0610** (0.0297) |
| lag( <i>Polcon</i> )     |                             | −0.0064 (0.0054)    |                     |                   | 0.0571* (0.0335) |                   |
| <i>Innovtrait</i>        | −0.0124*** (0.0046)         | −0.0122*** (0.0045) | −0.0134*** (0.0042) | 0.0116 (0.0225)   | 0.0135 (0.0248)  | −0.0011 (0.0320)  |
| <i>Four_traits</i>       | No                          | No                  | Yes                 | No                | No               | Yes               |
| <i>Control variables</i> | Yes                         | Yes                 | Yes                 | Yes               | Yes              | Yes               |
| Number of Observations   | 2880                        | 1926                | 2691                | 2885              | 1929             | 2696              |
| Variables                | Panel B: Government subsidy |                     |                     |                   |                  |                   |
|                          | Subsidy                     |                     |                     | Innov_subsidy     |                  |                   |
|                          | (1)                         | (2)                 | (3)                 | (4)               | (5)              | (6)               |
| <i>Polcon</i>            | 0.0662** (0.0323)           |                     | 0.0549* (0.0318)    | 0.0417* (0.0252)  |                  | 0.0486* (0.0264)  |
| lag( <i>Polcon</i> )     |                             | 0.0682** (0.0347)   |                     |                   | 0.0406 (0.0295)  |                   |
| <i>Innovtrait</i>        | −0.0043 (0.0295)            | −0.0052 (0.0300)    | −0.0123 (0.0358)    | 0.0006 (0.0189)   | −0.0016 (0.0196) | −0.0031 (0.0254)  |
| <i>Four_traits</i>       | No                          | No                  | Yes                 | No                | No               | Yes               |
| <i>Control variables</i> | Yes                         | Yes                 | Yes                 | Yes               | Yes              | Yes               |
| Number of Observations   | 2885                        | 1929                | 2696                | 2885              | 1929             | 2696              |

Note: We omit to report the coefficients of control variables for brevity. Robust standard errors clustered at industry level are in parentheses. Asterisks indicate statistical significance at 1% \*\*\*, 5% \*\*, and 10% \* levels.

### 5.1.2. Effects of political connections on corporate investment in fixed assets

The next question is how to use these economic resources. As analyzed before, how politically connected firms use these economic resources depends on the characteristics of the firm's entrepreneur (i.e., the spirit of innovation). We have already proven that a politically connected firm with innovative entrepreneur conducts more innovative activities. If this is the case, a conservative and traditional entrepreneur is probably inclined to invest in low-risk or safe projects, like fixed asset investment. Now we test whether politically connected firms undertake more low-risk projects. Due to the availability of data, we consider fixed asset investment which is the investment in physical assets such as machinery, land, buildings, or installations, etc. Such investments are usually low-risk projects, compared with innovative activities. Using the CEES data, we regress the model (3), and the results are shown in Panel A of Table 7. At the same time, we use the lagged value of *Polcon* and include other four personality traits into the model to alleviate the endogeneity problem of *Polcon*.

As shown in columns (1)–(4) in Panel A, we can draw two conclusions. First, the coefficients of *Polcon* are significantly positive in all four columns, which is consistent with our hypothesis. Take the column (3) for example. A politically connected firm increases its fixed asset investment by 59%. In reality, a politically connected firm can use its political resources to obtain various economic benefit and thus invest heavily in fixed assets to maintain high barriers to entry. Moreover, the politically connected firm sometimes have to undertake social or policy burdens, like increasing fixed asset investment to maintain the growth of local GDP, in exchange for favorable treatments from the government. Therefore, we can observe heavy investment in fixed assets for politically connected firms. As shown in columns (3) and (4) of Table 8, the investment in fixed assets has a significantly negative effect on the R&D investment. Take the column (4) of Table 8 for example. 1% increase in the fixed assets investment leads to 0.94% decrease in R&D investment. What's more important, the coefficients of *Polcon* and *Polcon* × *Innovtrait* become insignificant after the inclusion of economic benefits and fixed assets investment, which indicates that political connections have effects on the firm's R&D investment indeed through economic benefits and fixed assets investment.

Second, although the coefficients of *Innovtrait* are insignificant, the coefficients of *Polcon* × *Innovtrait* are significantly negative in all four columns in Panel A of Table 7, which means that politically connected firms' incentive to invest in fixed assets greatly reduces if their middle or senior managers have a strong spirit of innovation. According to the result in the column (3) of Table 7, the positive effect of political connections on fixed asset investment is offset and, as a result, the total effect becomes negative when the entrepreneur is full of innovative spirit. Therefore, a politically connected firm with an innovative entrepreneur is inclined to make less investment in low-risk projects.

To check the robustness, we consider another kind of investment. China traditionally puts a high value on social networks. For most Chinese firms, part of profits is usually reserved for entertainment activities that are indirectly related to or associated with conducting firm's business (e.g., taking a client to dinner), which is referred to as entertainment expense in China. Although entertainment expense is used to reduce transaction costs, entertainment activities divert some resources from innovative activities. In our sample, 71% of firms have entertainment expense. Now we investigate the effect of innovative spirit on such expense. Since the entertainment expense might be used to establish political connections, we use the methods mentioned above to alleviate the endogeneity problem of political connections. The results are shown in columns (1)–(4) in Panel B of Table 7. We still can observe that political connections have a positive effect on entertainment expense but the positive effect greatly reduces if the firm's entrepreneur has a strong spirit of innovation, which indicates that the firm with innovative entrepreneur mainly relies on innovation rather than an interpersonal relationship for development.

**Table 7**  
Effects of political connections on the low-risk investments.

| Variables                              | Panel A: Fixed asset investment |                   |                   |                    | Panel B: Entertainment expense |                   |                   |                   |
|--|---------------------------------|-------------------|-------------------|--------------------|--------------------------------|-------------------|-------------------|-------------------|
|  | (1)                             | (2)               | (3)               | (4)                | (1)                            | (2)               | (3)               | (4)               |
| <i>Polcon</i>                          | 0.6307** (0.3055)               | 0.6471** (0.3086) | 0.5905* (0.3111)  | 0.7102** (0.3305)  | 0.3233** (0.1463)              | 0.3805** (0.1489) | 0.3496** (0.1490) | 0.3826** (0.1859) |
| <i>Polcon</i> × <i>Innovtrait</i>      | -0.8999** (0.4052)              | -0.7391* (0.4149) | -0.7067* (0.4017) | -0.8156** (0.4139) | -0.2827 (0.1957)               | -0.3715* (0.2005) | -0.3339* (0.2009) | -0.3613 (0.2507)  |
| <i>lag(Polcon)</i>                     |                                 |                   |                   |                    |                                |                   |                   |                   |
| <i>lag(Polcon)</i> × <i>Innovtrait</i> |                                 |                   |                   |                    |                                |                   |                   |                   |
| <i>Innovtrait</i>                      | 0.0398 (0.1720)                 | -0.0192 (0.1617)  | -0.0834 (0.1629)  | -0.0129 (0.1788)   | 0.1530* (0.0826)               | 0.1807** (0.0855) | 0.1438* (0.0863)  | 0.1614 (0.1075)   |
| <i>Four_traits</i>                     | Yes                             | Yes               | Yes               | Yes                | Yes                            | Yes               | Yes               | Yes               |
| <i>Control variables</i>               | Partial                         | Partial           | All               | All                | Partial                        | Partial           | All               | All               |
| <i>F statistic</i>                     | 4.25**                          | 3.67*             | 5.32***           | 4.54**             | 3.17*                          | 2.50              | 2.93              | 2.41              |
| Number of Obs.                         | 2807                            | 2694              | 2679              | 1792               | 2824                           | 2711              | 2696              | 1803              |

Note: Control variables in column (1) in both Panels A and B include *Firm's main characteristics*, *Industry dummies*, and *Year dummies*. Control variables in column (2) in both Panels A and B include *Firm's main characteristics*, *Manager's characteristics*, *Industry dummies*, *City dummies*, and *Year dummies*. We omit to report the coefficients of control variables for brevity. Robust standard errors clustered at industry level are in parentheses. Asterisks indicate statistical significance at 1% \*\*\*, 5% \*\*, and 10% \* levels. The null hypothesis of *F statistic* is that the sum of the coefficients of *Polcon* and *Polcon* × *Innovtrait* is equal to zero.

**Table 8**  
Effects of economic benefits and fixed assets investment on the firm's innovation.

| Variables                         | R&D investment     |                     |                     |                     |
|-----------------------------------|--------------------|---------------------|---------------------|---------------------|
|                                   | (1)                | (2)                 | (3)                 | (4)                 |
| <i>Polcon</i>                     | -0.8685** (0.4202) | -0.7182* (0.4080)   | -0.7651* (0.4180)   | -0.4684 (0.4070)    |
| <i>Innovtrait</i>                 | 1.1950*** (0.2079) | 1.1777*** (0.2073)  | 1.1465*** (0.2118)  | 1.2045*** (0.2070)  |
| <i>Polcon</i> × <i>Innovtrait</i> | 1.6314*** (0.5431) | 1.0729** (0.5401)   | 0.9830* (0.5545)    | 0.6458 (0.5391)     |
| <i>Taxrate</i>                    |                    | -3.6651*** (1.3143) |                     | -3.5269*** (1.3120) |
| <i>Taxcut</i>                     |                    | 1.5915*** (0.2428)  |                     | 1.5817*** (0.2425)  |
| <i>Subsidy</i>                    |                    | 0.7810*** (0.2597)  |                     | 0.7200***           |
| <i>Innov_subsidy</i>              |                    | 1.0609*** (0.3308)  |                     | 1.0224*** (0.3317)  |
| <i>log(fixed_assets)</i>          |                    |                     | -1.0381*** (0.3775) | -0.9404** (0.3672)  |
| <i>Control variables</i>          | Yes                | Yes                 | Yes                 | Yes                 |
| <i>F statistic</i>                | 5.09**             | 4.67**              | 5.15***             | 3.14                |
| Number of Obs.                    | 2896               | 2891                | 2879                | 2874                |

Note: We omit to report the coefficients of control variables for brevity. Robust standard errors clustered at industry level are in parentheses. Asterisks indicate statistical significance at 1% \*\*\*, 5% \*\*, and 10% \* levels. The null hypothesis of *F statistic* is that the sum of the coefficients of *Polcon* and *Polcon* × *Innovtrait* is equal to zero.

To sum up, political connections indeed help firms obtain various economic benefits from the government which, however, are utilized to increase investment in the fixed asset. Such a positive effect of political connections on fixed asset investment or entertainment expense greatly reduces if firms' entrepreneurs are full of innovative spirit. Therefore, the empirical results in Tables 6-8 provide a reasonable explanation for the mixed evidence on the effect of political connections on corporate innovation.

### 5.2. Effects of different types of political connections on corporate innovation

In this paper, we employ two types of political connections: ascribed bureaucratic connection and achieved political connection. The ascribed bureaucratic connection was accumulated during entrepreneurs' earlier careers as full-time government employees or officials before they became business executives. Previous government working experience endows them with channels of communication and access to existing local government leaders due to their shared experience or networked relationships. But Faccio (2006) pointed out that ascribed bureaucratic connection becomes weaker as former officials left office. Therefore, government working experience may have little influences on the firm's performance.

Achieved political connection results from efforts and achievements from entrepreneurs' current roles and obligations. They are defined as political appointments to prestigious state organs (i.e., PC or CPPCC) acquired after entrepreneurs became successful business leaders. Achieved political connection is largely a result of ongoing cooperation and favor exchange between business and the government. As political "outsiders," the entrepreneurs gain political connections through efforts or achievements. For instance, the Chinese government rewarded the entrepreneurs of private enterprises via political appointments (Dickson, 2003). Once entrepreneurs obtain membership in the PC or CPPCC, they can directly get in touch with incumbent government officials, especially during the National People's Congress, to express what they need and seek benefits for their firms.

Since these two types of political connections differ in how and when they were accumulated and thus reflect different business-government relationships, we have reasons to believe that they have different effects on the firm's innovative behavior. Now, we construct two variables *Polcon*<sub>1</sub> and *Polcon*<sub>2</sub> to denote these two types of political connections, respectively. The definitions and statistical description are shown in Tables 1 and 2. After incorporating them and their interaction terms with *Innovtrait* into the model (1), we rerun the regression and the results are shown in Table 9. As you can see, it is the achieved political connection (*Polcon*<sub>2</sub>) that has a negative effect on R&D investment. At the same time, only the interaction term, *Polcon*<sub>2</sub> × *Innovtrait*, is highly significant and positive, and its magnitude is greater than that of *Polcon*<sub>2</sub>. Therefore, we can draw a conclusion that only achieved political connection hinders the firm's innovative activities but, as usual, such negative effect is offset and the total effect becomes positive if the firm's entrepreneur has a strong spirit of innovation.

Following the analysis before, we further explore why only achieved political connection plays a key role. First of all, we check that which connection helps firms obtain economic benefits. As shown in Panel A of Table 10, it is mainly the achieved political connection (*Polcon*<sub>2</sub>) that brings economic benefits to firms. Then, we study the effects of these two types of political connections on both fixed asset investment and entertainment expense, as shown in Panel B of Table 10. It can be seen that both types of political connections have positive effects on fixed asset investment and entertainment expense. But the positive effects of achieved political connection on them are greater than that of ascribed bureaucratic connection, which indicates that firms whose entrepreneurs are endowed with political identity usually have to undertake more social or policy burdens, like increasing fixed asset investment to maintain the growth of local GDP, in exchange for favorable treatments from the government. Moreover, entrepreneurs with political identity have to spend more on entertainment activities to maintain valuable membership in PC or CPPCC. Furthermore, only the interaction terms, *Polcon*<sub>2</sub> × *Innovtrait*, are significantly negative, and their magnitudes are greater than that of *Polcon*<sub>2</sub>. That is, firms with achieved political connection make less investment in fixed asset and entertainment if their entrepreneurs have a strong spirit of innovation.

**Table 9**  
Effects of different types of political connections on the firm's innovation.

| Variables                              | (1)                | (2)                | (3)                | (4)                | (5)                | (6)                | (7)                | (8)                | (9)                |
|--|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| R&D investment                         |                    |                    |                    |                    |                    |                    |                    |                    |                    |
| <i>Polcon<sub>1</sub></i>              | -0.2373 (0.6542)   | -0.1699 (0.6479)   | -0.0177 (0.6481)   |                    |                    |                    | -0.2993 (0.6534)   | -0.2150 (0.6474)   | -0.0611 (0.6476)   |
| <i>Polcon<sub>1</sub> × Innovtrait</i> | 1.0154 (0.8278)    | 1.2964 (0.8303)    | 1.3655 (0.8323)    |                    |                    |                    | 1.0803 (0.8270)    | 1.2482 (0.8304)    | 1.3173 (0.8323)    |
| <i>Polcon<sub>2</sub></i>              |                    |                    |                    | -1.2452** (0.5355) | -1.0785** (0.5421) | -1.0749** (0.5431) | -1.2631** (0.5358) | -1.1198** (0.5420) | -1.1071** (0.5432) |
| <i>Polcon<sub>2</sub> × Innovtrait</i> |                    |                    |                    | 1.7561** (0.6861)  | 1.5994** (0.6912)  | 1.5335** (0.6915)  | 1.7649** (0.6858)  | 1.6010** (0.6902)  | 1.5322** (0.6907)  |
| <i>Innovtrait</i>                      | 0.9151*** (0.2242) | 1.0421*** (0.2287) | 1.1490*** (0.2312) | 1.0064*** (0.2216) | 1.0865*** (0.2261) | 1.2031*** (0.2284) | 0.8551*** (0.2291) | 0.9500*** (0.2333) | 1.0684*** (0.2360) |
| <i>Four_traits</i>                     | Yes                | Yes                | Yes                | Yes                | Yes                | Yes                | Yes                | Yes                | Yes                |
| <i>Control variables</i>               | Partial            | Partial            | All                | Partial            | Partial            | All                | Partial            | Partial            | All                |
| <i>F statistic</i>                     | 1.33               | 1.89               | 1.56               | 4.03*              | 6.54***            | 5.82***            | 4.15*              | 6.61***            | 5.90***            |
| Number of Obs.                         | 2835               | 2722               | 2707               | 2835               | 2722               | 2707               | 2835               | 2722               | 2707               |

Note: Control variables in columns (1), (4) and (7) include *Firm's main characteristics*, *Industry dummies*, *City dummies*, and *Year dummies*. Control variables in columns (2), (5) and (8) include *Firm's main characteristics*, *Manager's characteristics*, *Industry dummies*, *City dummies*, and *Year dummies*. We omit to report the coefficients of control variables for brevity. Robust standard errors clustered at industry level are in parentheses. Asterisks indicate statistical significance at 1% \*\*\*, 5% \*\*, and 10% \* levels. The null hypothesis of *F statistic* in columns (7)–(9) is that the sum of the coefficients of *Polcon<sub>2</sub>* and *Polcon<sub>2</sub> × Innovtrait* is equal to zero.



**Table 10**  
Effects of different types of political connections on the economic benefits and low-risk investments.

| Variables                                      | Panel A: Economic benefits |                     |                     |                  | Panel B: Low-risk projects |                       |
|--|----------------------------|---------------------|---------------------|------------------|----------------------------|-----------------------|
|  | Taxrate                    | Taxcut              | Subsidy             | Innov_subsidy    | Fixed asset investment     | Entertainment expense |
|  | (1)                        | (2)                 | (3)                 | (4)              | (1)                        | (2)                   |
| <i>Polcon</i> <sub>1</sub>                     | -0.0053 (0.0059)           | 0.0535 (0.0341)     | 0.0110 (0.0365)     | 0.0372 (0.0377)  | 0.4500 (0.3354)            | 0.3049 (0.2142)       |
| <i>Polcon</i> <sub>1</sub> × <i>Innovtrait</i> |                            |                     |                     |                  | -0.3417 (0.4632)           | -0.1815 (0.3441)      |
| <i>Polcon</i> <sub>2</sub>                     | -0.0153* (0.0086)          | 0.0606 (0.0403)     | 0.0810* (0.0439)    | 0.0564* (0.0326) | 0.8169* (0.4757)           | 0.4912* (0.2801)      |
| <i>Polcon</i> <sub>2</sub> × <i>Innovtrait</i> |                            |                     |                     |                  | -1.0061** (0.4960)         | -0.5724* (0.3405)     |
| <i>Innovtrait</i>                              | -0.0133***<br>(0.0042)     | -0.0011<br>(0.0225) | -0.0069<br>(0.0266) | 0.0013 (0.0207)  | -0.1135 (0.1496)           | 0.1194 (0.1241)       |
| <i>Four_traits</i>                             | Yes                        | Yes                 | Yes                 | Yes              | Yes                        | Yes                   |
| <i>Control variables</i>                       | Yes                        | Yes                 | Yes                 | Yes              | Yes                        | Yes                   |
| <i>F statistic</i>                             |                            |                     |                     |                  | 4.86**                     | 2.55                  |
| Number of Observations                         | 2670                       | 2675                | 2675                | 2675             | 2658                       | 2675                  |

Note: We omit to report the coefficients of control variables for brevity. Robust standard errors clustered at industry level are in parentheses. Asterisks indicate statistical significance at 1% \*\*\*, 5% \*\*, and 10% \* levels. The null hypothesis of *F statistic* in Panel B is that the sum of the coefficients of *Polcon*<sub>2</sub> and *Polcon*<sub>2</sub> × *Innovtrait* is equal to zero.

The empirical results in Table 10 provide a possible explanation for why the ascribed bureaucratic connection hardly affects R&D investment. Specifically, if past government working experience is unable to bring economic resources to a firm, how can the firm increase R&D investment even if its entrepreneur has a strong spirit of innovation? One can't make bricks without straw. Therefore, different types of political connections indeed have different effects on corporate innovation. We find that only achieved political connection can help a firm obtain economic benefits and contribute to the firm's innovation if the firm's entrepreneur has a strong spirit of innovation.

## 6. Conclusions

In this paper, we attempt to reconcile the mixed effects of political connections on corporate innovation. We hypothesize that whether political connections contribute or impede corporate innovation depends on the spirit of innovation of a firm's entrepreneur. Using the CEES data, we construct an index (*Innovtrait*) to measure the entrepreneur's innovative spirit. By including *Innovtrait* and its interaction term with political connections, we empirically find that political connections indeed impede the firm's innovative activities, but such negative effect is offset and the total effect becomes positive as we consider the entrepreneur's spirit of innovation. That is, politically connected firms with innovative entrepreneurs become more innovative regarding R&D investment.

After solving the endogeneity problems of political connections and correcting the sample selection bias, our baseline results do not change much. Then we test the heterogeneity of the roles of innovative spirit in the relationship between political connections and corporate innovation. We find a politically connected firm with an innovative manager makes more investment in R&D, only when the firm is a high-tech enterprise, or it is located in areas with a higher degree of marketization, or it faces greater financial constraint, or it operates in highly competitive industries. Moreover, the baseline results are robust across different subsamples and different measurements of innovative spirit and innovation.

Then we explore the channels through which the innovative spirit changes the effects of political connections on corporate innovation. First, political connections indeed can help firms get tax preference and government subsidies. Second, politically connected firms increase the investment in fixed assets, which may drain economic resources away from other projects like innovative activities. But such positive effect of political connections on fixed asset investment greatly reduces if the firm's entrepreneur has a strong spirit of innovation. These results provide a reasonable explanation for the change in the direction of the effect of political connections on corporate innovation. We also consider the effects of different types of political connections on the firm's innovation. We find that only achieved political connections can help firms obtain economic benefits from the government and contribute to firms' innovation if the firms' entrepreneurs have a strong spirit of innovation.

Political connections are universally important, especially in developing and transitional countries like China. Innovation is a key determinant of firm competitiveness in both fast-growing high-tech sectors and more traditional sectors. Our results suggest that the Chinese government should take measures to motivate and cultivate the entrepreneur's innovative spirit, which is scarce in China, to exert the positive effects of political connections on corporate innovation. For example, the Chinese government can improve entrepreneurs' social status by reducing institutional discrimination against them. The government also can create a favorable economic environment to tolerate the entrepreneur's failure in innovative activities. We believe that the evidence from China is also useful for transitional countries that have institutional and economic characteristics that are similar to China.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.chieco.2018.12.002>.

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