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**HOW DOES POLITICAL POWER INFLUENCE
RESOURCE ALLOCATION, EVIDENCE FROM NSF
GRANT IN CHINA**

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**How Does Political Power Influence Resource Allocation,
Evidence from NSF Grant in China**

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**A thesis submitted in partial fulfilment of the requirements
for the degree of Master of Philosophy**

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How Does Political Power Influence Resource Allocation, Evidence from NSF Grant in China

Abstract

We study how political power affects resource allocation for knowledge production dictated by central planning in a non-market system. Our empirical results suggest that scholar with political privilege is associated with 15.7% more allocation granted by the National Natural Science Foundation of China (NSFC), especially towards applicants with high political hierarchy. Weaker institutional environment, less reputable universities and hard-to-value project determine variations in grant allocation related to political privilege. Our empirical results also suggest that high political hierarchy scholar shows political concern and do not enjoy significant favoritism in grant allocation under a more transparency environment. Further analysis suggest that access to NSFC fund not only benefits individual official scholar in research quality, but also more high-impact publications for the institute than fellows without political background, indicating that moderate political favoritism in resource allocation finally produce positive externality effect to knowledge production.

Keywords: Political power, Resource allocation, Political favoritism, Knowledge production, Positive effect

JEL Classification: O15, O34, P48

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1. Introduction

A growing literature regards knowledge production as a driving engine in endogenous growth model (Romer, 1986; Grossman and Helpman, 1991; Aghion and Howitt, 1992) due to technology spillovers (Arrow, 1962) and learning by firms (Cohen and Levinthal, 1989). Prior literatures relating knowledge production to political intervention mainly from firm perspective (Bronzini and Piselli 2016; Hou, Hu, and Yuan 2017; Tsai, Zhang and Zhao 2019). However, as for how political power influence fundamental research is less investigated. This research question is meaningful given that academic R&D output could produce spillover effect to private-sector patenting (Azoulay, Graff Zivin and Sampat 2019). We conjecture that government's continuous resource allocation on research and development (R&D) could play a critical role in addressing the market failure of diminishing returns on innovation discussed by Arrow (1962). On the other hand, in government dictated resource allocation, political intervention is a double-edged sword because of severe distortion in the central planning system (Hayek, 1945). Due to lack of competition and prevalent political connections, favoritism especially preference towards political interest is an important consideration in resource allocation by non-market institutions (Finan, 2004; Ansolabehere and Snyder, 2006; Aghion et al., 2009; Albouy, 2009; Khemani, 2007; Hoover and Pecorino, 2005; Arulampalam et al., 2009; Dixit and Londregan, 1996). These mixed results of political power on resource allocation motivate later scholars investigate this problem from an empirical perspective (Cohen, Coval and Malloy, 2011; Shoag, 2011; Sukhtankar, 2012; Giné and Kanz 2018).

In this paper, employing China NSFC Grant data, we investigate how political power affect fundamental academic research resource allocation. China serves as the ideal setting to study the resource allocation of knowledge production characterized with central planning by non-market institutions. Several academic research suggests the exist of favoritism in resource allocation due to political connections (Fan, Wong and Zhang, 2013) or hometown ties (Fisman et al., 2018) in China. In this paper, we provide empirical analysis on political favoritism of resource allocation for knowledge

production using a comprehensive dataset of research grants from the National Natural Science Foundation of China (NSFC) in China. China hosts the second largest economy and seeks for long-term sustainable economic growth through investment on R&D. Over the past decade, China's total expenditure on R&D has increased more than 20% annually, ranking second only behind U.S. in R&D spending (Ni et al., 2015). The National NSFC is the largest research-funding agency, providing 16.2 billion RMB (\$3.1 billion dollars) in 2013 alone, almost half of total basic R&D spending nationwide. NSFS grant is distributed to promising research projects regardless of its political status. Thus, NSFC grant allocation serve us an empirical setting to investigate how political power influence R&D resource allocation.

We use scholar political hierarchy proxy for his political power. Different from U.S. or other countries, academic scholars in China with political promotion by the government (the Ministry of Education) to take up official ranks such as administrators will undertake corresponding political ranks in hierarchy. We categorize the scholars in China into ones with political hierarchy and others without. For example, a president of a national university carries the political rank equivalent to vice minister, while a dean of a school has political rank equivalent to county level officials. The unique dual academic and political appointment for scholars allows us to collect information on political privilege of NSFC grant applicants nationwide. We manually collect all grant applications successfully approved by NSFC from 2003 to 2016. For each NSFC grant, we manually collect information of grant applicant, his/her university affiliation and official position according to political hierarchy.

Our empirical analysis shows that scholar with political power is associated 15.7% higher fund amount than other scholars. The results are still robust after inclusion of controls and subject fixed effects, project fixed effects, institution fixed effects and year fixed effects. The positive effect of political hierarchy on grants is increasing with high bureaucratic level. Cross sectional evidence suggests that variation of political favoritism is more salient in areas with less institutional environment, less reputable research institutions and with hard-to-value research programs. In the event analysis,

there is a significant and positive effect in granted funds after a scholar takes political position, suggesting political hierarchy increases research funding allocation by NSFC.

We further show the economic consequence of political favoritism in NSFC grant allocation. If political ties lower the threshold of applications, quality of research output will be lower for privileged scholars than regular ones. But what if those political connections are efficient in producing knowledge, those ties will eventually enhance future research output, which may not lead to research misallocation. We thus compare research quality measured as citation and publications between privileged and regular scholars after they are granted with NSFC funds. After politically privileged scholars receive NSFC grants, we find a larger improvement in her/his research quality, both publication and citation, at post one-year and three-year windows. A further test indicates that NSFC grants not only benefit scholars but also have a large impact on institute they belong to. Our results confirm that official scholars will have almost half more than other scholars without connection in future research productivity of the institute.

Our research contributes to understanding on the role of political favoritism in resource allocation in general. Fisman et al., (2018) studies the hometown ties bias in the fellow selection of the Chinese Academies of Sciences and Engineering. They find that personal hometown-connection highly increase the probability of election through in-person meeting. Colussi (2018) find that social connections increase the odds of article published in top general interest journals in economics. Li (2015) examines the similar reviewer-candidate-connected relationship during peer review process of national Institutes of Health in U.S. and finds that related candidate increases the chances of being funded. We provide a new concrete evidence that political privilege results in favoritism but finally produce positive output.

Our research also contributes to the literature of resource allocation across firms, especially due to political concerns. Hsieh and Klenow (2009) measure large gaps in marginal productions of labor and capital in China and India compared with the United States, showing that reallocation could lead to manufacturing total factor productivity

gains of 30%-50% in China and 40%-60% in India. While on the other side, there is a large literature shows that firm's political connection adds value (Roberts 1990; Fisman 2001; Faccio 2006; Ramalho 2007; Li et al. 2008; Khwaja and Mian 2005; Goldman, Rocholl and So 2013; Cooper, Gulen and Ovtchinnikov 2010; Amore and Bennedsen 2013; Akey 2015). Our evidences support that political connection could influence the allocation of resource significantly and finally produce positive outcomes.

The third contribution of this paper is to provide some evidence on the real scientific outcome of government research allocation. Goldfarb (2008) discovers that research-sponsor relationship experiences a decrease in research output. Jacob and Lefgren (2011) show a limited impact of scientific productivity when scientists receive funding from NIH. On the other hand, research grants from government could complement rather than substitute private external funding (Muscio, Quaglione, Vallanti, 2013). Dietz and Bozeman (2005) also find scientific careers within the industrial, academic and governmental sectors access to wider social networks and scientific or technical human capital, leading to higher productivity. Different from these studies, our paper indicates that although political favoritism in research allocation has distortion effect, it also enhance research productivity.

The rest of paper is organized in the following scheme. Section 2 describes the details of institutional background. Section 3 summarizes the data and describes the sample summary. Section 4 reports the main findings. Section 5 concludes the paper.

2. Institutional Background

The national Natural Science Foundation of China (NSFC) describes itself as “supporting basic research, fostering talented researchers, developing international cooperation and promoting socioeconomic development”. Founded in 1986, NSFC serves as the most important funding agency in supporting exploratory and basic research with a competitive, peer-reviewed, investigator-initiated approach.

There are other top government agencies, e.g., the Ministry of Science and Technology (MOST), Chinese Academy of Science (CAS), or Ministry of Education

(MOE), but NSFC is the most important engine in facility basic research, with the largest budget and the widest coverage of talents (Sun and Cao, 2014).

[Insert Figure 1 Here]

The Figure 1 shows that grants from NSFC increases dramatically, from 2.36 million RMB in fiscal year (FY) 2003 to 23.06 billion RMB (about 3.7 billion USD) in FY 2016. However, the total funding of NSFC is still less than NSF in United States (from 3.9 billion USD in 2000 to 7.5 billion USD in 2016)¹, but the compound annual growth rate of NSFC is amazing 20.7%. It's worth mentioning that research cost like labor cost, laboratory equipment is much cheaper in China compared to US.

It is not until 2002 that NSFC formed an academic advisory committee to ensure regulation of decision-making process. There are mainly eight scientific departments of NSFC: mathematical and physical sciences, chemical sciences, life sciences, earth sciences, engineering and materials sciences, information sciences, management sciences and health sciences. Each department is responsible for selecting, reviewing proposals and managing funded projects.

In accordance with objective to support innovative research in China, NSFC has established three main categories of programs covering main research programs, talent training programs, and research supporting programs. The main research programs are the most popular programs and consist of five sub research programs: general program; key program; major program; major research plan and international (regional) joint research program. The motivation as well as the requirement for each program varies. For example, the general program is to promote a balanced, coordinated and sustainable discipline development. Candidate could freely select topics within areas of each department. The international (regional) joint research program is to promote cooperation with international institutions, enhancing research impact globally.

3. Data Description and Summary Statistics

¹ Similar like NSFC, National Science Foundation (NSF) of United States created in 1950 to promote basic research. The more information could be found: <https://www.nsf.gov/about/>.

3.1 Data Description

We collect granted application from official website of national Natural Science Foundation of China (NSFC)². The NSFC's website discloses detailed information for each project, including project name, type, approval year, duration and grant amount etc. It also provides individual applicant information as well, such as candidate name, job position, department and her/his current institution. Totally, this sample covers 154 mainland institutions, from leading universities (such as Peking university, Tsinghua university which are classified as 985 universities aim to among worldwide top universities) to other reputed ones (the rests are classified as 211 universities and other institutions).

Scholars who can successfully obtain funds granted by NSFC committee generally disclose their information publicly. By searching their personal and professional information on Baidu Scholar (like Google Scholar, but usually in Chinese), we obtain a researcher's institution and academic performance, such as his/her publication and citation every year. The Baidu Scholar also provides H-index, a widely accepted index to measure the scholar's research ability, but only provide at the end of 2017. We also take a scholar's H-index as a proxy for the research productivity, combined with both citation and publication into account. To capture the exposure of a researcher, we also create exposure index at individual level as search volume index (SVI) follows Chi and Shanthikumar (2017). The exposure index tracks Baidu user's search volume of that scholar in a given institution at the end of 2017. This measure could possible capture a scholar's social activities, such as speech from media, think tank report to government, or donation to society etc.

For each granted application, we match recipient scholar's information from NSFC with Baidu Scholar based on name and institution. We exclude those scholars who experience their affiliation during the grant period.³ We also exclude researchers with missing information of institution. In other cases, there could be multiple search results

² The website provides detailed information starting from 2003. More information can be accessed through the website: <http://npd.nsf.gov.cn/>.

³ The main results are much stronger if multiple institutions are included.

due to common names in the same institution. The name ambiguity can cause obstacles to attribute NSFC approved project to a specific scholar. To address this overlap, we match scientific field of each scholar's research to NSFC grants in each field accordingly.⁴ Lastly, we perform a manual check of each scholar who cannot be identified with the above procedures.

The final sample consist of 109,905 NSFC approved projects with 54,946 scholars. (53.1% scholars applied once, 23.0% scholars applied twice, 24.0% scholars applied more than three times). Considering the impact of extreme values and outliers, we also winsorize all continuous variables at the 1st and 99th percentiles.

The main outcome variable $NSFCFundGrant_{it}$ is defined as total fund amount granted by NSFC committee to scholar i at year t . It is possible that one scholar receives multiple grants at a given year. In our sample, the average number of granted projects by each scholar is 1.02 with standard deviation of 0.188. By manually checking each researcher's position and his/her affiliated institution, we generate individual level variable $Official_i$, which defines as scholar i once served or serving as a vice-president (or above). $Official_i$ variable capture whether scholar own political power. Alternatively, we also generate $OfficialOn_{it}$ which defined as scholar i at year t is a current a vice-president (or above) before applying NSFC fund. Unlike U.S. academia, university presidents or administrators in China have political ranks corresponding to their political privilege. Presidents of regional universities carry political rank of vice-*Tingju* level, the same rank as a city vice-mayor. Presidents of national universities are entitled with vice-*Buju* level, the same rank as a provincial vice-governor. Thus, we generate two dummies *Buju* and *Tingju* to differentiate their hierarchic political ranks. *Buju* and *Tingju* dummy variable further capture scholar political power level. The detailed descriptions of these variables and controls are listed in the Appendix Table A.

3.2 Summary Statistics

⁴ In practice, after filtering by name, affiliated institution and research field, few cases (0.59%) of name/institution/field combination. We manually check these cases if they are unrelated fields.

[Insert Figure 2 Here]

As shown in Figure 2, the granted amount of both official scholars and other scholars shows an increasing trend. Obviously, the average mean amount of grants by official scholars is overwhelmingly larger than that by general scholars in every year. The median difference between two groups is not pronounced in early sample year but after 2011, their difference becomes apparent. We also examine the distribution of grants amount. Panel B of Figure 2 attributes the difference in grants to the largest quintile (Q5). This summary suggests that official scholars receive substantially more grants especially the large projects requiring heavy funding from the NSFC.

[Insert Table 1 Here]

Table 1 reports the summary statistics of all variables in our paper. In Panel A, NSFC grants on average have mean value of 510.3 thousand RMB and median value of 320 thousand. To avoid the right skewness in grants, we take the natural logarithm of grants in the regressions. On average, 1.68% of applicants are official scholars with political hierarchy, among the whole sample 1.57% being presidents or vice presidents of regional universities.

Panel B compares mean difference between official and regular scholars. The results present that scholars with political privilege generally have higher grant amount, research quality and research network resource than regular scholars. We can see the unconditional difference between official scholar and general scholar is 93 thousand RMB⁵, suggesting that 27% additional amount from NSFC for official scholars.

To show the difference in grants is not driven by leading universities, we separate all applications into two categories according to the ranking platforms in Panel C. In China, universities are categorized into three hierarchies according to ranks provided by Chinese Ministry of Education: 985, 211 and others. The difference in NSFC grants between official and regular scholars is relatively larger in 985 universities than in other universities. Panel D of Table 1 shows average grant amount for both official scholars and general scholars across years. Consistent with Figure 2, all the differences are

⁵ $\exp(6.078) - \exp(5.837) = 93.406$.

positively significant except for year 2006, and the wedge in grants becomes bigger after year 2011.

4. Hypothesis and Empirical Results

4.1 Baseline Regression

We carry out multivariate regression analysis to examine the research allocation toward political privilege of scholars. The main method we used is the pooled OLS regressions. The main reason for not using panel regression on individual level is that most official scholars are time invariant. Few scholars change their political status from non-official role to officials during our sample period.⁶ $Official_i$ is time invariant and will be absorbed due to the multicollinearity issue if panel regression is used. Thus, we employ the pooled OLS regression by adding various cross-sectional dummies and year dummies. We also use $OfficialOn_{it}$ as alternative measure to capture the exact time when a scholar is granted political ranks by the government. Our main specification takes as following,

$$\begin{aligned} LnNSFCGrant_{it} = & \beta_0 + \beta_1 Official_i(OfficialOn_{it}) \\ & + \beta_2 X_{it} + \alpha_j + \gamma_k + \delta_l + \varphi_t + \epsilon_{it} \end{aligned} \quad (1),$$

where i and t refer to a scholar i at year t . To avoid the skewness, the dependent variable is the natural logarithm of the total granted amount from national Natural Science Foundation at year t . The key variable of interest here is $Official_i(OfficialOn_{it})$. X is a vector of controls that includes previous research quality, such as entire citations and publication before NSFC granted, as well as the exposure index at the end of 2017. We also include a set of fixed effects, such as subject fixed effect (α_j), project fixed effect (γ_k), institution fixed effect (δ_l) and year fixed effect (φ_t), to rule out both cross-sectional and time-series unobservable effect. In regressions, robust standard errors adjusted for university-level clustering are reported in parentheses.

[Insert Table 2 Here]

⁶ In Table 7, we report similar results based on scholars who change from non-political ties to political ties.

In column 1, the estimated coefficient of the *Official* is 0.146, significant at the 1 percent level. It implies that a political hierarchy of scholars results in 15.7% more research fund granted by NSFC. Column 2 and 3 introduce more covariates: $\log(\text{Cite/Pub})$ and $\log(\text{Hindex})$ to proxy for scholar's research quality respectively; $\log(\text{Eindex})$ to proxy for the research network. These variables all have significant positive coefficient, which indicates that previous research performance facilitates grants allocated by NSFC.

In columns 4 to 6, we change our key variable to consider time variation of a scholar served as political position. OfficialOn_{it} denotes whether scholar i at year t holds official position or not at the time when applying for NSFC fund. The coefficient estimates of OfficialOn_{it} are even higher, indicating that 24.9% more NSFC funding will be granted for official scholars with concurrent political privilege. Overall, the results in Table 2 indicate that the effect of political privilege is economically significant.

[Insert Table 3 Here]

Next, we separate official scholars according to their hierarchy: *Buju* dummy or *Tingju* dummy. As we discussed above, scholars with vice-*Buju* level (or above) holds similar political power as a provincial vice-governor while scholars with vice-*Tingju* level (or above) ranks as a city vice-mayor. Our conjecture is that higher political rank results in more research resource allocation. Table 3 reports the empirical results. The estimated coefficients of *Buju* dummy are almost four times in the magnitude of *Tingju* dummy. Similar pattern appears for the estimation with *BujuOn* dummy (0.315) and *TingjuOn* dummy (0.146). This is consistent with our hypothesis that scholars with political privilege with higher hierarchy receive more allocation for research resource from NSFC system.

To investigate whether the effects of political favoritism vary across institutional environment, we run subsample tests by separating the whole sample into two groups depending on the median value of marketization index. The province-specified marketization index by national Economic Research Institute (Fan et al, 2012) is shown to track local market liberalization and economic development. The tests in Table 4

show that in area with relative lower institutional development, official scholars receive significantly more resource allocation than regular scholars do. This result is consistent with our prediction given that political favoritism is more prevalent in less marketization areas. NSFC committee executes a peer review evaluation process. Reviewer could easily infer applicant political status from application materials. Reviewer are more likely to please official scholar located in low marketization areas considering that official scholar in high marketization areas are less engage in private benefit exchange.

[Insert Table 4 Here]

Panel B of Table 4 reports the subsample tests according to political hierarchy (*Buju* and *Tingju*). The result suggests that official scholars with higher hierarchy receive more research resource in lower marketization provinces. The tests support our proposition that political favoritism towards hierarchy has greater impact in weak institutional environment. It is worth noting that *Buju* variable becomes insignificant in both column 3 and 4, suggesting that when facing more transparency environment, high political hierarchy scholar shows political concern and refrain themselves to influence resource allocation.

The National Natural Science Foundation of China is to promote research by allocating funds for both basic and applied research. Since basic research by nature is different from applied research. Thus, we are keen to understand whether political favoritism facilitates resource allocation for basic research that is more costly and hard to evaluate. Subjects on earth sciences, chemical sciences, mathematical and physical sciences, life sciences are classified as basic research, while subjects of engineering and materials sciences, management sciences, information sciences and health sciences are classified as applied research respectively.

[Insert Table 5 Here]

Table 5 reports results of political ties' effect on basic research and applied research respectively. Panel A indicate coefficients of *Official* and *OfficialOn* are all significant in two subsamples, but the magnitudes are greater in basic research. We find similar

results in Panel B, but the coefficients of *BujuOn* dummy are no longer significant in both subsamples. The evidence suggests that political ties have greater value when applying for basic research.

Reputation of institution matters as committee of NSFC explicitly require candidates provide research ability, resource and environment of their affiliated institutions. We, therefore, divide the whole sample into more reputable institutions (top 10 ranked universities in China according to the recent QS China University Ranking⁷). If political favoritism leads to unfair allocation, this favoritism will be more pronounced in less reputable universities. The results are reported in Table 6.

[Insert Table 6 Here]

Consistent with our hypothesis, political status of scholars in top universities do not receive significant favor in research resource allocation. The coefficients of *Official* and *OfficialOn* are significant and positive in less reputable universities, confirming the conjecture. Further, the coefficient estimates of hierarchy show consistent patterns. Given that only 1.68% of the full sample are official scholar, the statistics significance of the coefficient on official variable is questionable. After checking regression sample, there are 213 project (38 projects by buju scholar, 175 project by tingju scholar) applied by top-10 university official scholar. Thus, we conject Panel A of our regression specification is believable.

4.2 Robustness Checks

Official scholar are more senior and established in research. These established senior scholars may tend to work on larger and more impactful projects, which requires a greater amount of grant funding. To ensure our results is not driven by the benchmark selected, we limit our sample into large funding project. Our official scholar variable is

⁷ QS China University Ranking take into the account all kinds of factors including Academic peer review (40%), Faculty/Student ratio (20%), Citations per faculty (20%), Employer reputation (10%),International student ratio (5%),International staff ratio (5%). According to the ranking, the top 10 universities are Peking University, Fudan University, Tsinghua University, Shanghai Jiao Tong University, Zhejiang University, University of Science and Technology of China, Nanjing University, Beijing Normal University, WuHan University, Tongji University.

still significant. Then we also limit our sample in an official scholar who at least applied NSFC once from 2003 to 2016. This selection shrinks the observation to 1,844.⁸ The scholars in this sample are classified as *Official* in our main regression, representing less than 2% of the full sample. The *OfficialOn* captures her/his political position right before NSFC fund granted. We rerun the baseline regressions and report the result in Table 7.

[Insert Table 7 Here]

Column 1 reports that the coefficient of *OfficialOn* is 0.331, significant at 1 percent level. Consistent with our previous results, the test shows that 39% more fund granted through political ties for official scholars in office. The significant level is robust even when we include more control variables such as *Log(Cite/Pub)*, *Hindex*, and *Eindex* in Columns 2 and 3. In Column 4-6, we limit our sample to completed NSFC projects, which enables us to include one additional control variable project *duration*. Although the coefficient of *OfficialOn* decreases from 0.331 to 0.121, the significant level still holds. The overall findings suggest that extra funds are granted right after scholars get political promotion.

Omitted variables also might be one of endogenous concerns for our results. To validate it, we perform our baseline specification on completed NSFC projects including more variable, project duration and dummy for professorship. The results are reported in Table 8.

[Insert Table 8 Here]

Compared with our main regression, the observation drops to less than half of it since we excluded pending projects under NSFC. The coefficients of *Official* and *OfficialOn* remain significant at 1% level, although the magnitude coefficients of *Official* and *Officialon* decrease. It is also possible that other omitted variables like research team size may still impose concerns to our results. However, our cross-section test indicates that this may not be a big concern since in Table 6 *official* variable is less

⁸ As indicated by the Panel D of Table 1, the total number of granted NSFC from official scholars is 1,844.

pronounced in top 10 universities. Official scholars in top 10 universities obviously own larger research team. Having said this, we also need to admit that we can not ideally rule out all omitted variables concerns.

Our political power measurement may also confound with information advantage explanation. It is highly possible that political scholar, according to our definition, own more administrative power and personal relationships. They employ information advantage to strategically apply NSFC grant not political power. However, our cross-section test supports that information advantage may not play a decisive roles. Political scholar located in well-develop city and top university should have better information advantage. However, *official* variable becomes less significant in table 4 and 6, suggesting that political concern exist in more transparency environment.

4.3 Consequence of NSFC Funding

If an official scholar granted with more research resource, at least more funding from NSFC, two natural predictions follow. (1) Once granted, official scholars will produce higher research outcome in both quantity and quality. (2) Official scholar received more granted amount can increase research quality of the institution she or he belong to. To examine the first prediction, we provide event study on showing the research quality around years of receiving NSFC fund for both official scholars and the other scholars. The following specifications are used.

$$\begin{aligned} \ln Quality_{it+n} = & \beta_0 + \beta_1 Official_i \times Granted_t + \beta_2 Official_i \times Non - Granted_t \\ & + \beta_3 Granted_t + \beta_4 X_{it} + \alpha_j + \varphi_t + \epsilon_{it} \quad (3), \end{aligned}$$

where the dependent variable is research quality of scholars including citation and number of published peer-reviewed articles. The coefficient of $Official_i \times Granted_t$ captures the effect of NSFC fund allocated to official scholars at fiscal year t. $Official_i \times Non - Granted_t$ represents the effect of official scholars without receiving NSFC fund at fiscal year t. *Granted* is a dummy variable which equals to one if a scholar granted by NSFC. X is a vector of controls that includes previous three-year research quality. Different from main setting, we do not include the fixed effects

related to NSFC subject or project fixed effect. Instead, we include institution fixed effect since our specifications here aim to compare effect of NSFC grants on scholars. Another reason of not include project fixed effect is that information is missing for scholars without granted from NSFC. Similarly, the year fixed effect are still incorporated to rule out time-invariant effect. The rationale is that the quality of research output will be invariant to these two fixed effects. In all regressions, robust standard errors are clustered for each scholar, which are reported in parentheses. The results are reported in Table 9.

[Insert Table 9 Here]

From panel A of Table 9, we find large, statistically significant and positive coefficients of both $Official_i \times Granted_t$ and $Official_i \times Non - Granted_t$. This result confirms the previous conclusion that official scholars possess more citation and publication. The larger coefficients of $Official_i \times Granted_t$ is than those of $Official_i \times Non - Granted_t$ (F test is significantly positive except for specification in column 2). This comparison strongly supports the conclusion that official scholar significantly produces high-impact research output, such as more citations and publications in next three year with NSFC grant.

Besides, we also calculate individual granted amount from NSFC to validate effect of scholar's research outcome. Panel B of Table 9 investigate the size effect of NSFC granting on research quality of recipient scholars. All coefficients of $Official_i \times Granted Amount_t$ is around one fifth of the coefficients of $Official_i \times Non - Granted Amount_t$, both statistically significantly at 1% level. It suggests that marginal contribution of grants to research quality for official scholars is diminishing per amount.

We further are interested to find out our second implication. Whether grants from NSFC will encourage research output for the institute as a whole. If that is the case, will the political favoritism dominates this crowd-out effect or not? We then perform a regression aggregated at institute level and report our results in Table 10.

[Insert Table 10 Here]

As table 10 shown, both coefficients of $\text{Log}(\text{Offi Granted Amount})$ and $\text{Log}(\text{Non-Offi Granted Amount})$ is significantly positive, which confirms that grant amount can enhance the research outcome at university, from a more general perspective. More interestedly, it is also noteworthy that all magnitudes of $\text{Log}(\text{OffiGrantedAmount})$ are larger than those of $\text{Log}(\text{NonOffiGrantedAmount})$, signaling that grant amount distributed to official scholar can more efficiently promote institutional research quality in the future 1 and 3 years. One possible explanation could be that official scholars got positive feedback from NSFC grants, which encourage them to take more efforts and input to improve affiliation institution research quality. This again indicates there is a spillover effect of knowledge production from NSFC resource allocation.

5. Conclusion

We address a fundamental question on how political power affects resource allocation. Many previous studies have documented that political favoritism is prevalent due to lack of competition and presence of political connections. Our research confirm that resource allocation prioritizes political privilege in a non-market system. However, we also provide evidence that this favoritism is not necessary leads to bad outcome. We choose the grant allocation of NSFC as the setting to shed new lights on this question for several reasons. NSFC serves as the most important funding agency on behalf of the state to finance basic and applied research in China. Research and Development are regarded as the critical factor in knowledge production.

We provide solid evidence that political privileged facilitate scholars receive more research grant allocation from the NSFC in China. The extent to which favoritism facilitates research grants is increasing in the hierarchy of official scholars. Weaker institutional environment, less reputable universities and hard-to-value project determine variations in grant allocation related to political privilege. Besides, more transparency environment may raise political concern and could lower political power effect on resource allocation.

We also show that moderate political favoritism in NSFC grant allocation finally results in efficiency. Scholars with bureaucratic rank experience an increase in quality

of research output after receiving NSFC grant compared to other scholars. However, the marginal product of funding allocated to political scholars is decreasing.

Overall, our research shed lights on how political power plays its role in resource allocation. There are several important policy implications. Policy maker should take political favoritism into consideration in non-market resource allocation sectors. However, political favoritism is not necessary leads to adverse consequence. Moderate more resources tilt to agent with political power may finally enhance the whole system benefits.

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Appendix
Variable Descriptions

Variables	Descriptions	Source
Log(NSFC Grant)	The natural logarithm of one plus granted amount from NSFC. <i>NSFC Grant</i> is granted amount of funded project approved by NSFC. All granted amount are normlized to 1000 RMB	NSFC
Official	A dummy variable equals to one if an applicant with political ties. The political ties refer to scholar who holds position as (vice-) president of an institution.	University Website
OfficialOn	A dummy variable equals to one if an applicant with current political ties. The current political ties refer to scholar who currently holds position as (vice-) president of an institution.	University Website
Buju	A dummy variable equals to one if an applicant with political ties at Buju. This Buju refer to scholar who holds position as vice-Buju level or above, the same rank as a provincial vice-governor.	University Website
BujuOn	A dummy variable equals to one if an applicant with current political ties at Buju. This Buju refer to scholar who currently holds position as vice-Buju level or above, the same rank as a provincial vice-governor.	University Website
Tingju	A dummy variable equals to one if an applicant with political ties at Tingju. This Tingju refer to scholar who holds position as vice-Tingju level or above, the same rank as a city vice-mayor.	University Website
TingjuOn	A dummy variable equals to one if an applicant with current political ties at Tingju. This Tingju refer to scholar who currently holds position as vice-Tingju level or above, the same rank as a city vice-mayor.	University Website
Log(Cite)	The natural logarithm of one plus scholar's cumulative citation at previous five years before granted by NSFC.	Baidu Scholar
Log(Pub)	The natural logarithm of one plus scholar's cumulative publication at previous five years before granted by NSFC.	Baidu Scholar
Log(Cite/Pub)	The natural logarithm of one plus scholar's logarithm of cumulative citation divided by his/her logarithm of cumulative publication at previous five years before granted by NSFC.	Baidu Scholar
Log(Hindex)	The natural logarithm of one plus H-index of a scholar given institution at the end of 2017. The H-index consider both research quantity and quality of a scholar's outcome.	Baidu Scholar

Log(Eindex)	The natural logarithm of one plus search volume index (SVI) of a scholar given institution at the end of 2017.	Baidu Search Engine
Log(Pre3Cite)	The natural logarithm of one plus average citation at pre three years before granted from NSFC.	Baidu Scholar
Log(Aft3Cite)	The natural logarithm of one plus average citation at post three years after granted from NSFC.	Baidu Scholar
Log(Pre3Pub)	The natural logarithm of one plus average publication at pre three years before granted from NSFC.	Baidu Scholar
Log(Aft3Pub)	The natural logarithm of one plus average publication at post three years after granted from NSFC.	Baidu Scholar
Prof	A dummy variable equals to one if the applicant holds a full professor.	NSFC
Duration	Time duration (in month) for each completed project.	NSFC
Type	Dummy variables indicate types of program classified by NSFC.	NSFC
Subject	Dummy variables indicate eight subjects by NSFC.	NSFC
School Platform	Dummy variables indicate institutions belong to 985/211/rest.	University Website
Granted	A dummy variable equals to one when a scholar obtained NSFC fund at fiscal year.	NSFC
Granted Amount	The total granted amount the scholar obtained at fiscal year.	NSFC

Figure 1 Total NSFC Granted Amount by Year

This figure plots the total granted amount distributed by NSFC from year 2003 to year 2016. The line represents the aggregated grants at each fiscal year of NSFC.

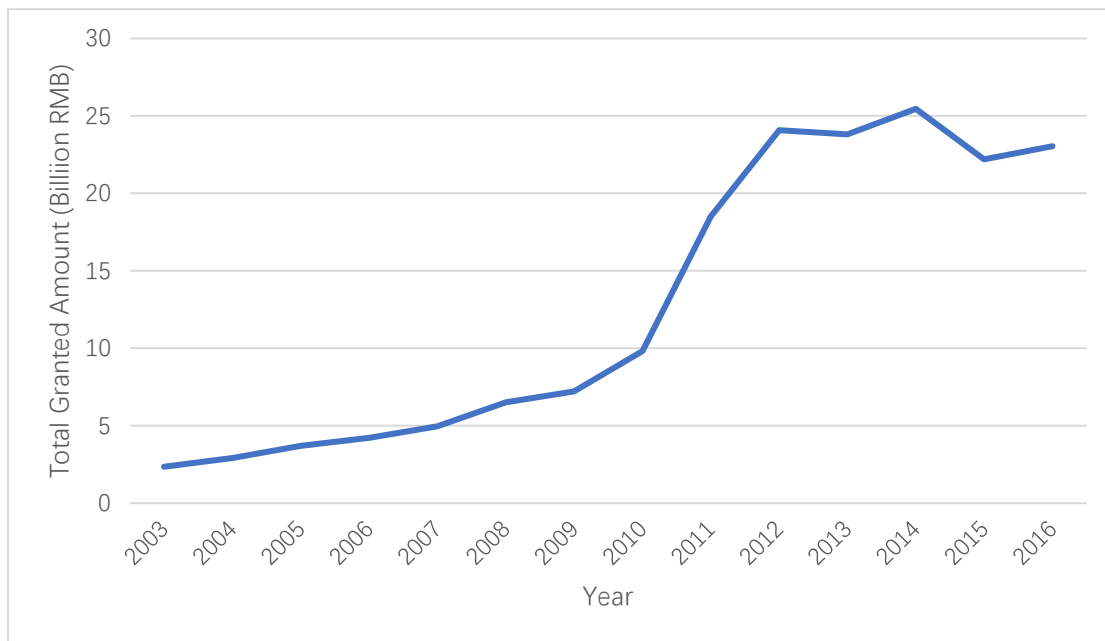
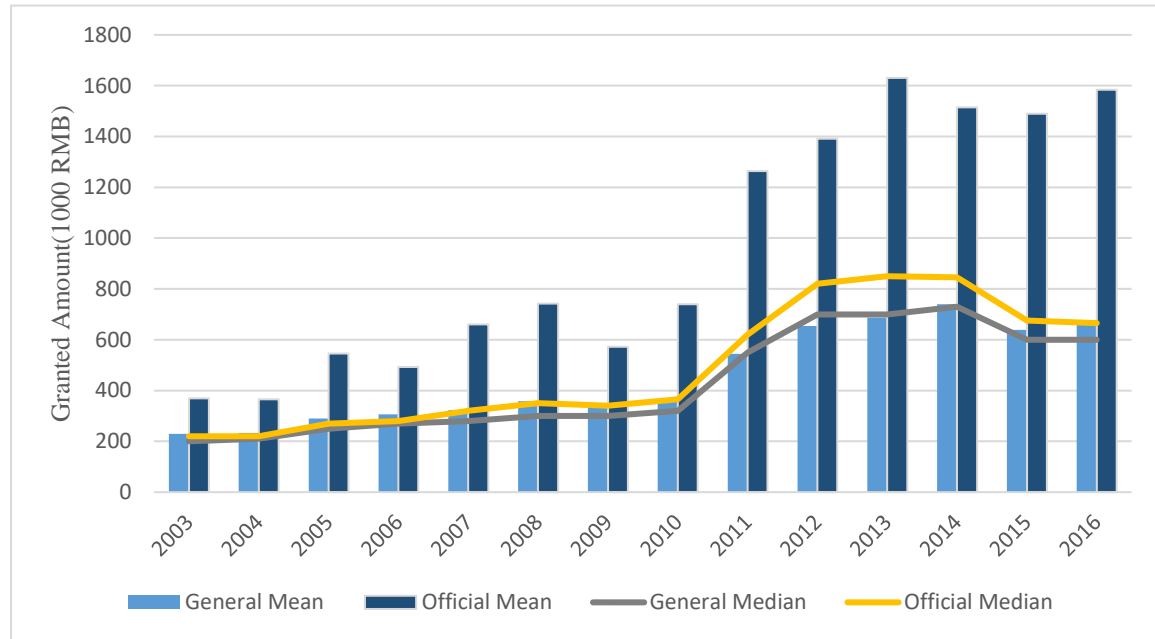


Figure 2 NSFC Granted Amount of Scholars

This figure plots average and median amount of official scholars and general scholars from NSFC from year 2003 to year 2016. In Panel A, the bars represent the mean value and two lines draw the median value of these two groups respectively. While the bars in Panel B compare the average granted amount of official scholars and general scholars depends on the quantile of individual research grant. The Q5 means the largest grants from NSFC and the Q1 means the smallest grants from NSFC.

Panel A NSFC Granted Amount of Scholars by Year



Panel B NSFC Granted Amount of Scholars by Individual Amount

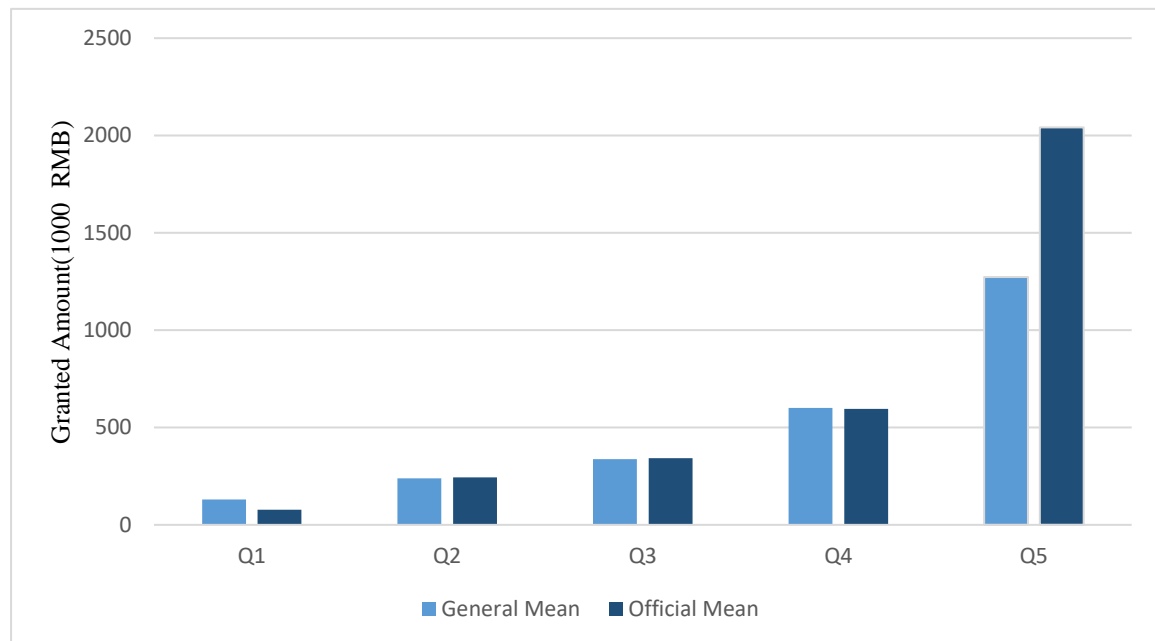


Table 1 Summary Statistics

This table reports the summary statistics from 2003 to 2016. Panel A describe all the key variables in this paper. *NSFC Grant* is granted amount of applied project approved by NSFC in thousand RMB. *Log (NSFC Grant)* is the natural logarithm of one plus granted amount from NSFC. *Official* is an indicator equals to one if an applicant with political ties. The political ties refer to scholar who holds position as (vice-) president of an institution. *OfficialOn* denotes whether an applicant with current political ties. Detailed definitions of other variables are provided in the Appendix A. Panel B compares the mean difference of variables between official scholars and general scholars. Panel C reports the mean difference from NSFC grants depends on school platform. Panel D compares the average difference of two groups across year.

Panel A: Descriptive Statistics								
	Obs.	Mean	Median	S.D.	P10	P25	P75	P90
NSFC Grant	109,905	510.3	320.0	550.2	160.0	220.0	640.0	830.0
Log(NSFC Grant)	109,905	5.841	5.771	0.976	5.081	5.398	6.463	6.723
Official (%)	109,905	1.68%	0.00%	12.84%	0.00%	0.00%	0.00%	0.00%
OfficialOn (%)	109,905	0.75%	0.00%	8.64%	0.00%	0.00%	0.00%	0.00%
Buju (%)	109,905	0.11%	0.00%	3.29%	0.00%	0.00%	0.00%	0.00%
Tingju (%)	109,905	1.57%	0.00%	12.43%	0.00%	0.00%	0.00%	0.00%
BujuOn (%)	109,905	0.10%	0.00%	3.09%	0.00%	0.00%	0.00%	0.00%
TingjuOn (%)	109,905	0.66%	0.00%	8.08%	0.00%	0.00%	0.00%	0.00%
Cite/Pub	109,905	9.945	6.083	12.163	1.444	2.933	12.000	22
Log(Cite/Pub)	109,905	1.997	1.958	0.861	0.894	1.369	2.565	3.135
Cite	109,905	464.5	183.0	789.5	19	60.0	503.0	1177
Log(Cite)	109,905	5.116	5.215	1.566	2.996	4.111	6.223	7.072
SumPub	109,905	45.27	29.00	48.15	8	15.00	57.00	103
Log(Pub)	109,905	3.391	3.401	0.970	2.197	2.773	4.060	4.644
Eindex	109,905	15368	2300	34136	63	469	15600	38300
Log(Eindex)	109,905	7.686	7.741	2.372	4.159	6.153	9.655	10.553
Hindex	109,905	18.73	16.00	11.85	7	10.00	24.00	35
Log(Hindex)	109,905	2.809	2.833	0.602	2.079	2.398	3.219	3.584
Panel B: Mean Comparison								
	Official Scholars			General Scholars				
	N	Mean	S.E.	N	Mean	S.E.	Dif	
Log(NSFC Grant)	1,844	6.078	0.035	108,061	5.837	0.003	0.241	***
Log(Cite/Pub)	1,844	2.150	0.020	108,061	1.995	0.003	0.155	***
Log(Eindex)	1,844	10.195	0.034	108,061	7.644	0.007	2.551	***
Log(Hindex)	1,844	2.150	0.020	108,061	1.995	0.003	0.155	***
Panel C: Log (NSFC Grant) by School Platform								
	N	Mean	S.E.	N	Mean	S.E.	Dif	
985 Universities	761	6.175	0.062	65,489	5.854	0.004	0.321	***
Other Universities	1,083	6.011	0.041	42,572	5.812	0.004	0.199	***

Panel D: Log (NSFC Grant)**By Year**

Year	N	Mean	S.E.	N	Mean	S.E.	Dif	
2003	114	5.273	0.120	3,754	4.933	0.019	0.340	***
2004	141	5.152	0.117	4,584	4.928	0.018	0.223	**
2005	173	5.563	0.109	5,051	5.222	0.016	0.342	***
2006	147	5.407	0.116	5,340	5.399	0.012	0.008	
2007	132	5.804	0.119	5,710	5.423	0.012	0.381	***
2008	130	5.901	0.127	6,742	5.579	0.010	0.322	***
2009	137	5.751	0.110	7,408	5.579	0.009	0.172	***
2010	154	5.964	0.109	9,302	5.627	0.008	0.337	***
2011	124	6.631	0.119	11,235	6.034	0.007	0.597	***
2012	163	6.796	0.110	11,421	6.197	0.008	0.600	***
2013	109	6.996	0.124	10,394	6.237	0.008	0.759	***
2014	136	6.720	0.128	9,083	6.294	0.009	0.426	***
2015	86	6.919	0.137	9,350	6.178	0.008	0.742	***
2016	98	6.967	0.135	8,687	6.204	0.009	0.762	***

Table 2 Main Regression of NSFC Grants by Political Ties

This table reports the effect of individual political ties on NSFC research grants from 2003 to 2016. The dependent variable is *Log (NSFC Grant)* denoting as the natural logarithm of one plus granted amount from NSFC. *Official* is an indicator equals to one if an applicant with political ties. The political ties refer to scholar who holds position as (vice-) president of an institution. *OfficialOn* denotes whether applicant with current political ties. Detailed definitions of other control variables are provided in the Appendix A. We also included project subject, type, institution and year fixed effect. The robust standard errors reported in parentheses are clustered at scholar level. ***, ** and * represent statistical significance at the 1%, 5% and 10% levels respectively.

	Log(NSFC Grant)					
	(1)	(2)	(3)	(4)	(5)	(6)
Official	0.146*** (0.019)	0.097*** (0.019)	0.078*** (0.019)			
OfficialOn				0.222*** (0.030)	0.167*** (0.030)	0.144*** (0.030)
Log(Cite/Pub)		0.044*** (0.002)			0.044*** (0.002)	
Log(HIndex)			0.124*** (0.004)			0.124*** (0.004)
Log(EIndex)		0.022*** (0.001)	0.013*** (0.001)		0.023*** (0.001)	0.013*** (0.001)
Constant	7.354*** (0.100)	7.050*** (0.100)	6.737*** (0.099)	7.363*** (0.100)	7.053*** (0.101)	6.739*** (0.099)
Subject FE	Yes	Yes	Yes	Yes	Yes	Yes
Type FE	Yes	Yes	Yes	Yes	Yes	Yes
Institution FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	109,905	109,905	109,905	109,905	109,905	109,905
adj. R-sq	0.752	0.756	0.758	0.752	0.756	0.758

Table 3 NSFC Grants by Hierarchical Political Ties

This table reports the ranking of political ties on NSFC research grants from 2003 to 2016. The dependent variable is $\text{Log}(\text{NSFC Grant})$ denoting as the natural logarithm of one plus granted amount from NSFC. *Buju* is a dummy variable equals to one if an applicant with political ties at *vice-Buju* level or above, the same rank as a provincial vice-governor. *BujuOn* is a dummy variable equals to one if an applicant with current political ties at vice-Buju level or above. *Tingju* is a dummy variable equals to one if an applicant with political ties at vice-Tingju level or above, the same rank as a city vice-mayor. *TingjuOn* is a dummy variable equals to one if an applicant with current political ties at vice-Tingju level or above. Detailed definitions of other control variables are provided in the Appendix A. We also included project subject, type, institution and year fixed effect. The robust standard errors reported in parentheses are clustered by institution. ***, ** and * represent statistical significance at the 1%, 5% and 10% levels respectively.

	Log(NSFC Grant)			
	(1)	(2)	(3)	(4)
Buju	0.291*** (0.105)	0.272*** (0.103)		
Tingju	0.084*** (0.019)	0.065*** (0.019)		
BujuOn			0.315*** (0.112)	0.297*** (0.110)
TingjuOn			0.146*** (0.029)	0.121*** (0.029)
Log(Cite/Pub)	0.044*** (0.002)		0.044*** (0.002)	
Log(HIndex)		0.124*** (0.004)		0.124*** (0.004)
Log(EIndex)	0.022*** (0.001)	0.013*** (0.001)	0.023*** (0.001)	0.013*** (0.001)
Constant	7.048*** (0.101)	6.735*** (0.099)	7.051*** (0.101)	6.737*** (0.100)
Subject FE	Yes	Yes	Yes	Yes
Type FE	Yes	Yes	Yes	Yes
Institution FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	109,905	109,905	109,905	109,905
adj. R-sq	0.756	0.758	0.756	0.758

Table 4 NSFC Grants by Local Marketization Environment

This table reports the effect of political ties on NSFC research grants by local institutional environment from 2003 to 2016. We divide the whole sample according to the median level of marketization index where research institution is located. In Panel A, we use *Official* and *OfficialOn* as two main key proxies for the official scholars. While in Panel B, we further differentiate hierarchical position into *Buju*, *Tingju* and *BujuOn*, *TingjuOn* respectively. The dependent variable is *Log(NSFC Grant)* denoting as the natural logarithm of one plus granted amount from NSFC. Detailed definitions of other control variables are provided in the Appendix A. We also included project subject, type, institution and year fixed effect. The robust standard errors reported in parentheses are clustered at scholar level. ***, ** and * represent statistical significance at the 1%, 5% and 10% levels respectively.

Panel A: Political Ties	Log(NSFC Grant)			
	(1)	(2)	(3)	(4)
	Low Mkt		High Mkt	
Official	0.104*** (0.025)		0.058** (0.028)	
OfficialOn		0.177*** (0.036)		0.090* (0.048)
Log(Cite/Pub)	0.046*** (0.003)	0.046*** (0.003)	0.043*** (0.004)	0.043*** (0.004)
Log(EIndex)	0.025*** (0.001)	0.025*** (0.001)	0.020*** (0.001)	0.020*** (0.001)
Constant	7.303*** (0.126)	7.311*** (0.126)	7.096*** (0.141)	7.095*** (0.141)
Subject FE	Yes	Yes	Yes	Yes
Type FE	Yes	Yes	Yes	Yes
Institution FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	57,447	57,447	34,237	34,237
adj. R-sq	0.762	0.762	0.761	0.761
Panel B: Hierarchical				
Political Ties	(1)	(2)	(3)	(4)
	Low Mkt		High Mkt	
Buju	0.443*** (0.115)		0.039 (0.127)	
Tingju	0.080*** (0.024)		0.059** (0.028)	
BujuOn		0.433*** (0.130)		0.112 (0.138)
TingjuOn		0.134*** (0.033)		0.087* (0.051)
Log(Cite/Pub)	0.045***	0.045***	0.043***	0.043***

	(0.003)	(0.003)	(0.004)	(0.004)
Log(EIndex)	0.024***	0.025***	0.020***	0.020***
	(0.001)	(0.001)	(0.001)	(0.001)
Constant	7.302***	7.309***	7.096***	7.094***
	(0.126)	(0.126)	(0.141)	(0.141)
Subject FE	Yes	Yes	Yes	Yes
Type FE	Yes	Yes	Yes	Yes
Institution FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	57,447	57,447	34,237	34,237
adj. R-sq	0.762	0.762	0.760	0.760

Table 5: NSFC Grants by Discipline

This table reports the effect of political ties on NSFC research grants by research discipline from 2003 to 2016. The whole sample is grouped by candidate's subject to basic research or applied research. Subjects on earth sciences, chemical sciences, mathematical and physical sciences, life sciences are classified as basic research, while subjects on engineering and materials sciences, management sciences, information sciences and health sciences are classified as applied research respectively. In Panel A, we use *Official* and *OfficialOn* as two main key proxies for the official scholars. While in Panel B, we further differentiate hierarchical position into *Buju*, *Tingju* and *BujuOn*, *TingjuOn* respectively. The dependent variable is *Log(NSFC Grant)* denoting as the natural logarithm of one plus granted amount from NSFC. Detailed definitions of other control variables are provided in the Appendix A. We also included project subject, type, institution and year fixed effect. The robust standard errors reported in parentheses are clustered at scholar level. ***, ** and * represent statistical significance at the 1%, 5% and 10% levels respectively.

Panel A: Political Ties	Log(NSFC Grant)			
	(1)	(2)	(3)	(4)
	Basic Research		Applied Research	
Official	0.080*** (0.025)		0.066** (0.028)	
OfficialOn		0.157*** (0.042)		0.112** (0.044)
Log(Cite/Pub)	0.047*** (0.004)	0.047*** (0.004)	0.032*** (0.003)	0.032*** (0.003)
Log(EIndex)	0.022*** (0.001)	0.022*** (0.001)	0.017*** (0.001)	0.017*** (0.001)
Constant	7.386*** (0.058)	7.386*** (0.058)	7.205*** (0.044)	7.205*** (0.044)
Subject FE	Yes	Yes	Yes	Yes
Type FE	Yes	Yes	Yes	Yes
Institution FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	48,173	48,173	58,099	58,099
adj. R-sq	0.769	0.769	0.756	0.756
Panel B: Hierarchical				
Political Ties	(1)	(2)	(3)	(4)
	Basic Research		Applied Research	
Buju	0.130** (0.064)		0.177 (0.128)	
Tingju	0.079*** (0.026)		0.056** (0.028)	
BujuOn		0.092 (0.070)		0.193 (0.132)

TingjuOn		0.160***		0.095**
		(0.044)		(0.044)
Log(Cite/Pub)	0.047***	0.047***	0.032***	0.032***
	(0.004)	(0.004)	(0.003)	(0.003)
Log(EIndex)	0.022***	0.022***	0.017***	0.017***
	(0.001)	(0.001)	(0.001)	(0.001)
Constant	7.386***	7.385***	7.201***	7.201***
	(0.058)	(0.058)	(0.044)	(0.044)
Subject FE	Yes	Yes	Yes	Yes
Type FE	Yes	Yes	Yes	Yes
Institution FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	48,173	48,173	58,099	58,099
adj. R-sq	0.769	0.769	0.756	0.756

Table 6 NSFC Grants by Institution Reputation

This table reports the effect of political ties on NSFC research grants by institution reputation from 2003 to 2016. We classify the all research institutions into two groups. The top 10 universities are classified by *2017 QS Universtiy Ranking*. In Panel A, we use *Official* and *OfficialOn* as two main key proxies for the official scholars. While in Panel B, we further differentiate hierarchical position into *Buju*, *Tingju* and *BujuOn*, *TingjuOn* respectively. The dependent variable is *Log(NSFC Grant)* denoting as the natural logarithm of one plus granted amount from NSFC. Detailed definitions of other control variables are provided in the Appendix A. We also included project subject, type, institution and year fixed effect. The robust standard errors reported in parentheses are clustered at scholar level. ***, ** and * represent statistical significance at the 1%, 5% and 10% levels respectively.

Panel A: Political Ties	Log(NSFC Grant)			
	(1)	(2)	(3)	(4)
	Top 10 Universities		Other Universities	
Official	0.076 (0.056)		0.101*** (0.021)	
OfficialOn		0.126 (0.080)		0.176*** (0.032)
Log(Cite/Pub)	0.040*** (0.005)	0.040*** (0.005)	0.046*** (0.002)	0.046*** (0.002)
Log(EIndex)	0.020*** (0.001)	0.020*** (0.001)	0.023*** (0.001)	0.023*** (0.001)
Constant	7.156*** (0.157)	7.155*** (0.157)	7.116*** (0.128)	7.123*** (0.129)
Subject FE	Yes	Yes	Yes	Yes
Type FE	Yes	Yes	Yes	Yes
Institution FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	31,223	31,223	78,682	78,682
adj. R-sq	0.744	0.744	0.764	0.764
Panel B: Hierarchical				
Political Ties	(1)	(2)	(3)	(4)
	Top 10 Universities		Other Universities	
Buju	0.072 (0.068)		0.396*** (0.142)	
Tingju	0.077 (0.066)		0.086*** (0.020)	
BujuOn		0.087 (0.060)		0.416*** (0.150)
TingjuOn		0.151 (0.124)		0.150*** (0.030)
Log(Cite/Pub)	0.040***	0.040***	0.046***	0.046***

	(0.005)	(0.005)	(0.002)	(0.002)
Log(EIndex)	0.020***	0.020***	0.023***	0.023***
	(0.001)	(0.001)	(0.001)	(0.001)
Constant	7.156***	7.154***	7.112***	7.119***
	(0.157)	(0.157)	(0.129)	(0.129)
Subject FE	Yes	Yes	Yes	Yes
Type FE	Yes	Yes	Yes	Yes
Institution FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	31,223	31,223	78,682	78,682
adj. R-sq	0.744	0.744	0.764	0.765

Table 7 Robustness Regression of NSFC Grants by Political Ties

This table reports baseline results but limits the sample only in official scholars from 2003 to 2016. The dependent variable is *Log(NSFC Grant)* denoting as the natural logarithm of one plus granted amount from NSFC. *OfficialOn* denotes whether an applicant with current political ties. The current political ties refer to scholar who holds current position as (vice-) president of an institution before applying for NSFC grant. Detailed definitions of other control variables are provided in the Appendix A. We also included project subject, type, institution and year fixed effect. The robust standard errors reported in parentheses are clustered at scholar level. ***, ** and * represent statistical significance at the 1%, 5% and 10% levels respectively.

	Log(NSFCGrant)					
	(1)	(2)	(3)	(4)	(5)	(6)
OfficialOn	0.331*** (0.046)	0.150*** (0.046)	0.342*** (0.048)	0.121*** (0.035)	0.066*** (0.024)	0.061** (0.024)
Log(Cite/Pub)		0.432*** (0.032)			0.017 (0.029)	
Log(Hindex)			0.038 (0.060)			0.063 (0.052)
Log(Eindex)		-0.036** (0.016)	-0.040** (0.018)		0.017** (0.009)	0.013 (0.010)
Duration					0.055*** (0.005)	0.055*** (0.005)
Constant	8.049*** (0.373)	7.377*** (0.497)	8.368*** (0.452)	3.568*** (0.522)	2.801*** (0.460)	2.547*** (0.371)
Subject FE	Yes	Yes	Yes	Yes	Yes	Yes
Type FE	Yes	Yes	Yes	Yes	Yes	Yes
Institution FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	No	No	No	No
N	1844	1844	1844	841	841	841
adj. R-sq	0.708	0.748	0.708	0.824	0.918	0.918

Table 8 Robustness Regression of Completed NSFC Projects by Political Ties

This table reports the effect of individual political ties on completed NSFC research grants from 2003 to 2015. The dependent variable is *Log (NSFC Grant)* denoting as the natural logarithm of one plus granted amount from NSFC. *Official* is an indicator equals to one if an applicant with political ties. The political ties refer to scholar who holds position as (vice-) president of an institution. *OfficialOn* denotes whether applicant with current political ties. *Duration* measures the period (in month) for each completed project. *Prof* is a dummy variable equals to one if the applicant holds a full professor. Detailed definitions of other control variables are provided in the Appendix A. We also included project subject, type, institution and year fixed effect. The robust standard errors reported in parentheses are clustered at scholar level. ***, ** and * represent statistical significance at the 1%, 5% and 10% levels respectively.

	Log(NSFC Grant)					
	(1)	(2)	(3)	(4)	(5)	(6)
Official	0.071*** (0.016)	0.040*** (0.011)	0.033*** (0.011)			
OfficialOn				0.142*** (0.027)	0.092*** (0.021)	0.084*** (0.021)
Log(Cite/Pub)		0.017*** (0.002)			0.017*** (0.002)	
Log(HIndex)			0.047*** (0.003)			0.047*** (0.003)
Log(EIndex)		0.007*** (0.001)	0.004*** (0.001)		0.007*** (0.001)	0.004*** (0.001)
Duration		0.046*** (0.000)	0.046*** (0.000)		0.046*** (0.000)	0.046*** (0.000)
Prof		0.060*** (0.003)	0.051*** (0.003)		0.060*** (0.003)	0.051*** (0.003)
Constant	7.298*** (0.034)	5.540*** (0.029)	5.440*** (0.030)	7.300*** (0.034)	5.540*** (0.029)	5.440*** (0.030)
Subject FE	Yes	Yes	Yes	Yes	Yes	Yes
Type FE	Yes	Yes	Yes	Yes	Yes	Yes
Institution FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	44,921	44,921	44,921	44,921	44,921	44,921
adj. R-sq	0.717	0.884	0.885	0.717	0.884	0.885

Table 9 Research Quality of Scholars with Political Ties after NSFC Granted

This table reports the impact of research quality of each scholar after receiving NSFC grants from year 2003 to 2016. All specifications are paneled at scholar and year level. The dependent variables in first two columns are the natural logarithm of research quality at post one-year after granted from NSFC while the last two columns are the natural logarithm of average research quality at post three-year after granted from NSFC. In Panel A, the main interested variables are two dummies, *Granted* and *Non-Granted*. *Granted* is an indicator equals to one when a scholar obtained NSFC fund at given year and *Non-Granted* is a dummy variable equal to one if the rest of scholars does not receive NSFC fund. While in Panel B, the main interested variables are *Granted Amount* and *Non-Granted Amount*. *Granted Amount* represents the total amount granted to each scholar at given year. *Non-Granted Amount* equals to one if a scholar does not receive NSFC fund. *Official* is an indicator equals to one if an applicant with political ties. The political ties refer to scholar who holds position as (vice-) president of an institution. The control variables include previous average three-year research quality before NSFC granted. We also included institution and year fixed effect. The robust standard errors reported in parentheses are clustered at scholar level. ***, ** and * represent statistical significance at the 1%, 5% and 10% levels respectively.

Panel A: Granted Dummy	(1)	(2)	(3)	(4)
	Log(Cite) _{t+1}	Log(Pub) _{t+1}	Log(Cite) _{t+3}	Log(Pub) _{t+3}
Official×Granted (a)	0.414*** (0.030)	0.292*** (0.033)	0.194*** (0.018)	0.258*** (0.019)
Official×Non-Granted (b)	0.333*** (0.028)	0.329*** (0.024)	0.155*** (0.016)	0.213*** (0.017)
Granted	0.149*** (0.003)	0.118*** (0.003)	0.099*** (0.002)	0.108*** (0.002)
Log(Cite) _{t-3}	0.345*** (0.002)		0.739*** (0.001)	
Log(Pub) _{t-3}		1.123*** (0.003)		0.656*** (0.002)
Constant	-0.918*** (0.054)	-2.471*** (0.061)	-3.038*** (0.049)	-1.008*** (0.038)
Institution FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	596,765	596,765	596,765	596,765
adj. R-sq	0.277	0.611	0.740	0.496
F statistic of the test: (a)- (b)=0	9.39***	2.27	6.22***	7.31***

Panel B: Granted Amount	(1)	(2)	(3)	(4)
	Log(Cite) _{t+1}	Log(Pub) _{t+1}	Log(Cite) _{t+3}	Log(Pub) _{t+3}
Official×Granted Amount (a)	0.061*** (0.005)	0.044*** (0.005)	0.029*** (0.003)	0.038*** (0.003)
Official (b)	0.334*** (0.028)	0.331*** (0.024)	0.155*** (0.016)	0.214*** (0.017)
GrantedAmount	0.026*** (0.000)	0.021*** (0.000)	0.017*** (0.000)	0.019*** (0.000)
Log(Cite) _{t-3}	0.344*** (0.002)		0.738*** (0.001)	
Log(Pub) _{t-3}		1.122*** (0.003)		0.655*** (0.002)
Constant	1.215*** (0.050)	1.223*** (0.051)	1.917*** (0.038)	1.120*** (0.032)
Institution FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	596,765	596,765	596,765	596,765
adj. R-sq	0.277	0.611	0.740	0.496
F statistic of the test: (a) - (b)=0	-111.90***	-178.04***	-80.40***	-126.76***

Table 10 Research Quality of Official Scholars at Institute Level

This table reports the impact of granted official scholar aggregated at institute level from year 2003 to 2016. The dependent variables in first two columns are the natural logarithm of aggregated research quality at post one-year after granted from NSFC while the last two columns are the natural logarithm of aggregated research quality at post three-year after granted from NSFC. *Log(Offi Granted Amount)* represents the natural logarithm of one add official scholars' total granted amount for each institute by year. *Log(Non-Offi Granted Amount)* represents the natural logarithm of one add non-official scholars' total granted amount by year. The control variables include institution level previous three-year total research quality before NSFC granted, total number of granted scholars and H-index and Exposure Index at school level. We also included institution and year fixed effect. The robust standard errors reported in parentheses are clustered at institution level. ***, ** and * represent statistical significance at the 1%, 5% and 10% levels respectively.

	(1)	(2)	(3)	(4)
	Log(Cite) _{t+1}	Log(Pub) _{t+1}	Log(Cite) _{t+3}	Log(Pub) _{t+3}
Log(Offi Granted Amount)	0.113*** (0.022)	0.142*** (0.027)	0.108*** (0.022)	0.125*** (0.026)
Log(Non-Offi Granted Amount)	0.078*** (0.014)	0.096*** (0.017)	0.074*** (0.014)	0.088*** (0.017)
Log(Cite) _{t-3}	0.001 (0.026)		-0.017 (0.023)	
Log(Pub) _{t-3}		0.000 (0.029)		-0.036 (0.027)
Log(No. of Institution)	0.417*** (0.106)	0.568*** (0.109)	0.431*** (0.105)	0.583*** (0.108)
Log(Hindex)	3.674*** (0.412)	2.064*** (0.342)	3.691*** (0.402)	2.171*** (0.355)
Log(Eindex)	-0.007 (0.070)	-0.035 (0.067)	-0.015 (0.069)	-0.038 (0.066)
Constant	-3.867*** (0.684)	-1.806*** (0.534)	-2.372*** (0.657)	-0.814 (0.540)
Institution FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	2423	2423	2423	2423
adj. R-sq	0.989	0.984	0.991	0.988