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# Essays in China's Anti-corruption Campaign

by

Xi Lu

A dissertation submitted in partial satisfaction of the

requirements for the degree of

Doctor of Philosophy

in

Agricultural and Resource Economics

in the

Graduate Division

of the

University of California, Berkeley

Committee in charge:

Professor Brian D. Wright, Chair
Professor David Zilberman
Professor Thibault Fally
Professor Peter L. Lorentzen

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**Essays in China's Anti-corruption Campaign**

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Xi Lu

## Abstract

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Professor Brian D. Wright, Chair

China's unique system of hiring and promoting talented people within the state, under the supervision of the Communist Party, has been held up as an important institutional factor supporting its remarkably rapid and sustained economic growth. Jointly with Professor Peter L. Lorentzen, we explore this meritocracy argument in the context of Chinese leader Xi Jinping's ongoing anti-corruption campaign. Some question the sincerity of the campaign, arguing that it is nothing but a cover for intra-elite struggle and a purge of Xi's opponents. In the first chapter of my thesis, we use a dataset I have created to identify accused officials and map their connections. Our evidence supports the Party's claim that the crackdown is primarily a sincere effort to cut down on the widespread corruption that was undermining its efforts to develop an effective meritocratic governing system. First, we visualize the "patron-client" network of all probed officials announced by the central government and identify the core targets of the anti-corruption campaign. Second, we use a recursive selection model to analyze who the campaign has targeted, providing evidence that even personal ties to top leaders have provided little protection. Finally, we show that, in the years leading up to the crackdown, the provinces later targeted had departed from the growth-oriented meritocratic selection procedures evident in other provinces.

In addition to its motivation, I also discuss the campaign's effects on economic efficiency. The second chapter of my thesis tests the "greasing-the-wheels" hypothesis in the context of China's residential land market. We show that China's anti-corruption campaign, aimed at removing corruption in China's monopoly land market, caused a decrease in land transaction volumes. Furthermore, not removing any form of corruption would also lead to a similar decrease. It is only necessary to remove corruption that enables real estate developers to circumvent red tape and reduce trading costs. Our findings support the "greasing-the-wheels" hypothesis hypothesis: when an economy has a low outcome owing to some preexisting distortions, corruption could be a positive factor in that it offers a "second-best world."

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# Chapter 1

# Rescuing Autocracy from Itself: China's Anti-Corruption Campaign

## 1.1 Introduction

Since China began to move away from a planned, autarkic economic model in the late 1970s, its sustained and rapid economic growth-averaging over 8% per year - has lifted over 800 million people out of poverty. While this growth has many causes, one that has attracted considerable attention in recent years is China's governance structure. The Chinese Communist Party (CCP) controls appointments to essentially all government posts. This might appear to be a recipe for unaccountable kleptocracy, but a large body of research argues that the Party's top leaders have structured incentives for the army of bureaucrats along largely meritocratic principles, inducing them to choose growth-promoting policies (Maskin et al., 2000; Qian et al., 2006; Xu, 2011)- a conclusion embraced by the regime and its most articulate supporters in international media (Li, 2012; Bell, 2015). Moreover, empirical studies have found a positive correlation between China's GDP growth rate and the likelihood of promotion within the CCP-controlled hierarchy (Li and Zhou, 2005; Chen et al., 2005; Guo, 2009; Choi, 2012; Landry et al., 2015; Chen and Kung, 2016). Other studies have challenged these findings, concluding that promotion is mainly a reward for individual loyalty and personal connections (Tao et al., 2010; Shih et al., 2012; Arcand et al., 2015). A key problem these studies face is that the relationships among political actors can only be inferred from shared personal histories, such as overlapping work experiences.

In this paper, we explore the debate about meritocracy and factionalism in the context of the dramatic and wide-ranging anti-corruption campaign China's president (and CCP General Secretary) Xi Jinping initiated upon taking power at the end of 2012. Unlike prior anti-graft efforts, this crackdown has taken down a large number of officials on all levels, both elite "tigers" and ordinary "flies". The CCP claims this campaign is a serious attempt to shake up an officialdom in which endemic self-dealing has undermined past reform efforts

and harmed the Party's legitimacy in the eyes of citizens.[1] This view is shared by many in China who admire President Xi for addressing a problem that received only lip service from his predecessors, as well as from some academic analysts (Manion, 2016). The majority of others, however, argue that this initiative is aimed primarily at consolidating Xi's power by removing his factional rivals and their supporters (Yuen, 2014; Murong, 2015; Eisenman and Chung, 2015).

The CCP has been unusually forthcoming in publicizing the identities and alleged crimes of the accused and the relationships between them, providing a unique glimpse into the factional networks that stretch from the Party's elites down to its grassroots. To our knowledge, this paper is the first empirical study of this campaign. Combing through a wide range of materials, we identified all individuals publicly charged by the CCP's internal investigations unit, the Central Committee on Discipline and Inspections (CDIC), and constructed a dataset of their alleged crimes, their work backgrounds, and their relationships with other accused. Using this data, we first mapped the implied corruption networks, identifying the top targets of the campaign. This helped us identify three "big tigers" whose interconnected networks are at the center of the crackdown. Notably, the individual viewed as Xi's most significant rival, Bo Xilai, and his supporting network appear to play a relatively ancillary role, going against the idea that power consolidation is a central goal of the campaign.

To provide a stronger empirical test, we estimated how personal relationships affected the likelihood of corruption charges being brought, developing a recursive probit model to address the selection bias in anti-corruption actions. We find that even personal ties to top leaders appear to have provided little protection. We then explore why this campaign may have started and taken the form that it has. Creating a dataset of prefecture-level leaders, we show that the provinces targeted by the corruption campaign differed from the rest in important ways. In particular, while most provinces appeared to rewarded performance and pedigree, in the three targeted provinces, promotion was divorced from either one. Instead, the best path to promotion was enthusiastic participation in the corruption network. We therefore argue that the key factor leading to the purge of these provinces' top leaders and their networks may have been their departure from existing Party norms. While a certain amount of self-dealing and cronyism had become expected, these provinces had moved away from the system of promotion and advancement that the Party believed helped legitimize its rule and strengthen its governance.

The remainder of the paper proceeds as follows. In section II, we visualize the "patron-client" network of all probed officials announced by the central government. By calculating centrality measures, we identify the core targets of the anti-corruption campaign. In section III, we empirically test the correlation between factional ties and the odds of provincial-level officials being investigated, showing evidence of limited factional struggles beyond the purged factions. Section IV compares promotion patterns in the provinces controlled by the purged factions with the patterns of other provinces. We test a broader range of meritocratic criteria

[1] Xi Jinping, Speech on the 6th plenary session of the 18th Central Commission for Discipline Inspection, January, 2016.

to show how non-meritocratic promotion correlates with a higher probability of prefecture-city leaders of being probed. Finally, section V concludes the paper.

## 1.2 A Network of Probes

### Background

The anti-corruption campaign initiated by Xi Jinping, who was confirmed General Secretary as the top leader of the Party in November 2012, is thought to be the largest shock to Chinese officialdom over the past 25 years. Xi issued an "eight-point regulation" to govern the behavior of Party members at the grassroots level. The restrictions are imposed not only on their working hours, but also cover every aspect of their daily lives (Yuen, 2014). As of October 2015, 104,934 violations of the regulations had been probed, with 138,867 Party members publicly punished.[2]

The procedure for charging an official with corruption usually follows in three stages. First is an internal investigation, which is conducted by the Party's discipline inspection commission at different levels. The official is detained and interrogated "at an appointed time and place" (*shuanggui*). Generally, he is isolated from colleagues, legal counsel, and even family members. When this step finishes, the case against the probed official will be moved to the judicial process. The procuratorate then starts to collect criminal evidence and prepare for the impending prosecution. In the last step, the court hears the case and makes a formal decision of indictment.

The duration of the entire procedure varies among different cases. For complicated cases, it may last for two years or more.[3] Usually, when the disciplinary agency forces an official to take "*shuanggui*", it has often already found enough evidence to establish guilt. As such, announcements of probes by the Party will end in conviction with very few exceptions. In this paper, we use the words "probe", "investigation" or "indictment" interchangeably to such a case, regardless of the stage that case is in.

### Reported Political Connections

The Central Discipline Inspection Commission (CDIC) regularly posts the most influential cases on its website.[4] Up to September 2015, more than 1000 names had been added to the CDIC's list, at the rate of almost one per day. Among these names, 82 were senior officials with the administrative ranks higher than or equivalent to "assisting roles of ministries and provinces (*fu shengbuji*)", and four were national leaders. To illuminate the probes' networks, we collected a dataset of all cases posted by the CDIC between November 2012

[2]The Central Commission for Discipline Inspection. http://www.ccdi.gov.cn/xwtt/201512/t20151203_69389.html.

[3]Two provincial leaders (Baiyun and Nie Chunyu) were formally convicted in October 2016. The probes for both men were announced by the Party's discipline inspection commission in 2014.

[4]http://www.ccdi.gov.cn/jlsc/.

and September 2015. For each probed official, we searched all the reports, news and legal documents about his or her downfall.[5] From reading those materials, we specified the one-to-one patron-client relationship between each two probed officials (A and B) if one of the following scenarios (S1-S3) was applicable.

S1: Investigation of official A has entered the judicial process; official B is proved to be involved in A's case by published legal documents.[6]

S2: A connection between A and B was reported in the form of bylined articles from an authoritative news outlet.[7]

S3: A connection between A and B was reported in the form of rumors but quoted in bylined articles from authoritative media.[8]

Though the evidence from legal documents is credible, we admit the process of identifying political connections from media reports could be prone to error. One possible flaw comes from the different media treatments between high-profile and less influential cases. For the most attractive targets, such as Zhou Yongkang, Bo Xilai, and Ling Jihua, the media would utilize many resources to uncover hidden stories. Hence, the political connections behind these names are more likely to be revealed. By contrast, an ordinary corrupt official is not worth the trouble. Our solution for alleviating the influence of this bias was to track connections from the bottom to the top. We focused on identifying the supervisors of an investigated official and checking whether they have also been investigated and placed on the central government's list. Unidirectional searching is helpful in collecting more information on an implied corruption network, but it doesn't necessitate ignoring information coming from the other direction. Another possible flaw of the "media-reported" connection is over-interpretation. To highlight the value of their news, media have the tendency to claim a "connection" between two probed officials based on any overlaps in their experiences. Aside from adhering to the above scenarios (S1-S3), we also compared news and reports from different sources and were cautious in examining any dubious connections.[9]

[5]Legal documents include CDIC inspection reports, indictments and verdicts, if available.

[6]For example, in the indictment against Zhou Yongkang, a former vice governor of Sichuan province (Li Chuncheng) testified to offering bribes to Zhou. Then Li was identified as a member in Zhou's faction.

[7]For example, Chen Anzhong, a former Deputy Director of the Standing Committee of the Jiangxi National People's Congress, was reported to have offered bribes to Su Rong and his wife by The Beijing News (Xinjing Bao), the most widely circulated newspaper that covers Beijing and nearby areas.

[8]The typical case is Bai Enpei, the former Party Secretary of Yunnan province. Multiple influential media reported his connection to Zhou Yongkang by quoting from "a reliable source". Usually, such rumors describe one or more specific events that happened between patron and client. In the case of Bai, he admitted to have taken care of the business of Zhou's son, following instructions from Zhou. The Sina News, 31 August 2014, http://news.sina.com.cn/c/2014-08-31/175930772328.shtml.

[9]One example is Bai Yun, a former provincial leader of Shanxi. Like other high-ranking corrupt officials in the same province, Bai Yun is considered a follower of Ling Jihua, especially because she was removed from the head position in Ling's birthplace. However, an in-depth report argues that the experience of Bai Yun in Ling's hometown was a transitional period before she was promoted to a higher position. To be prudent, we did not code a patron-client relation between Bai Yun and Ling Jihua without other convincing evidence. Caixin.com, 21 October, 2014, http://china.caixin.com/2014-10-21/100741328.html.

In spite of these principles and cautious steps, it is admittedly hard to eliminate all biases from news and reports. Nevertheless, our method is an improvement on the connection indicators previously used in the field of elite politics. Shih et al. (2010) first suggested three indicators to proxy factional connections: being born in the same province (*tongxiang*), having graduated from the same school (*tongxue*), or having overlapping work experiences (*tongshi*). Their contribution is remarkable for taking initial steps in quantifying factional connections. But when the media reports political connections, journalists base their reports on these same indicators but with less noise because of their diligence in filtering information. Therefore, identifying patron-client relationships from media reports could have advantages over simply using the factional indicators as proxies.

## A Network Diagram

Figure 1 graphs the networks implied by our data. Each node represents a probed official. A line connecting two dots represents a reported political connection. The attached arrows point from clients to patrons. The size of each node is determined by the number of lines connected to it. To distinguish officials, we color those in red that are ranked equal to or above the "leading roles of ministries and provinces" (*zheng shengbuji*).

A striking feature of the diagram is the interconnected group in the center (157 observations), which is separated from those on the periphery (900 observations). Obviously, their network intensities are different. Compared with the central group, the connections among the nodes on the periphery are much weaker. Though some small groups within it have the potential to become a faction, they lack external connections with other nodes.

The compositions of the two parts of Figure 1 are also different. The central group contains more high-ranking officials. Only four ranked as "leading roles of ministries and provinces" (*zheng shengbuji*) fall on the periphery while twelve are connected to the central group. On the other hand, only 3.82% of the probes in the central group are of county-level officials while the corresponding percentage on the periphery is 17.67%. Moreover, the central group is composed of more governmental officials (89.17%) and fewer leaders from state-owned enterprises (9.55%) or public-institutions (1.27%). As a comparison, only 76.33% of the nodes on the periphery are governmental officials.

## Measuring Network Centrality

To specify the cores targeted by the anti-corruption campaign, we use three measurements to calculate the network centrality for each probed official in Figure 1. The first is *connection degree*. In a network, connection degree counts the number of nodes to which each node is linked. A higher degree indicates that an official attaches to multiple political relationships and should be treated seriously. However, this measurement does not take into account the direction of connections. A probed official with a higher connection degree is not necessarily the center of a network, but may point to a role of a bridge connecting two other nodes or

groups. The introduction of *pagerank* and *betweenness centrality* efficiently makes up for the shortfall.

"Pagerank" is an algorithm widely used to measure the importance of website pages: More important websites receive more links from other websites. In the network diagram, if we randomly pick a probed official as the starting point and track connections along the arrows, we have the greatest possibility of arriving at an official who is dominant in pagerank. Being higher in pagerank suggests that an official has a lot of followers who have also been investigated, and he likely stands on the upper level of the network. The "betweenness centrality" of a node is computed as the number of shortest paths from all vertices to all others that pass through that node. It is an indicator of the importance of an official acting as an "agent" or intermediary for his supervisor to control other subordinates.

Combining the three measurements, we can determine the importance of a probed official by the scope of his faction and his relative network status. If a node is at the core of the network, we should expect it to have a greater degree of connection and to be higher in pagerank but lower in the betweenness centrality.

## The "Big Tigers"

In the anti-corruption campaign, the Party uses the word "big tigers" to describe important targets. There are multiple views on who the top big tigers are. Table 1 compares the central group with the periphery in terms of connection degree and pagerank, respectively. As shown, the average connection degree of officials on the periphery is only one-tenth of those in the central group and their highest pagerank is only one-sixth of the central group's. Thus, we can infer that the real big tigers should be located in the central cluster. Looking at the depicted network, we can recognize some familiar names in the central cluster, including Zhou Yongkang, Ling Jihua, and Bo Xilai. To identify the targeted big tigers, we compare the measurements of the probed officials in the network.

Figure 2 shows the degree of connection and pagerank for senior officials[10] in the network diagram. Hollow circles highlight the senior officials with the administrative ranks of "leading roles of ministries and provinces"(*zheng shengbuji*). The size of each symbol is determined by betweenness centrality. As shown, three Party leaders stand out: Zhou Yongkang, Ling Jihua and Su Rong. Having a greater degree of connection suggests that they are more interconnected with other probes. Meanwhile, topping pagerank means that they supervised many other fallen high-ranking officials. In addition, none of them is likely to be an agent of someone else because their betweenness centralities are the lowest. All of these features indicate that Zhou, Ling and Su are the cores of the network. That is, they are the big tigers targeted by the central government.

It is noteworthy that, based on our network measurements, Bo Xilai does not appear as a top big tiger despite the initial prominence of his case. People commonly believed that

[10]Officials with administrative ranks equal to or above the "assisting roles of ministries and provinces"(*fu shengbuji*).

the crackdown on Bo was really a fight against a challenger for the top CCP leadership (Broadhurst and Wang, 2014). However, the probe network shows that few of Bo's followers have been probed. If the anti-corruption campaign sought to crack down political rebellions, we should expect to see more of Bo's factional members in the network. Therefore, power struggles may not be the first priority of the anti-corruption campaign.

Identifying the "big tigers" in the implied corrupt network is the foundation for further empirical tests in this paper. It indicates the objective factions that have been purged in the anti-corruption campaign. In Section III, we will see how factional ties to these Party leaders Zhou, Ling and Su - affect the possibility of being probed; and in Section IV, we will compare the promotion patterns between the provinces controlled by these three big tigers and the other provinces.

## 1.3 Political Purge: A Joint Effort of the Incumbent Leadership

In the CCP's history, factional struggle within the Party has never stopped unless the entire system faced strong enemies, such as the Kuomintang and the Japanese (Tsou and Nathan, 1976; Tsou, 1995). Nathan (1973) holds a similar view, arguing that when enemies threaten the resources over which factions are struggling, the factions will unite behind a suitable leader to guard the legitimacy of the system. Thus, the key to identifying the essence of the current anti-corruption campaign is the attitudes held by other factions. We have known that President Xi Jinping is the initiator of the campaign; his ally Wang Qishan, who is in charge of the Party's disciplinary agencies, is the executor, and the "Zhou-Ling-Su" coalition is their target. What is the attitude of other factions?

If the anti-corruption campaign were really a fight between Xi Jinping and his rivals, other factions should have the incentive to stay away by sheltering their own members - or at least the followers of President Xi and his allies should be protected. If there is no evidence of self-protection (i.e., that being connected to the Party's incumbent leadership decreases probe odds), then the anti-corruption campaign is less likely to be a power struggle. Instead, it should be regarded as a joint effort against threats to the entire regime because the majority is assumed to support it.

In this article, we generate a recursive selection model to test the attitudes of current members of the CCP's Politburo Standing Committee (PSC) - the Party's top leadership. The question to be answered is whether the incumbents-including Xi and Wang - are keeping their own followers away from stray bullets.

## A Dataset of Provincial Leaders

The dataset we are using was generated from a list of the Party's provincial Politburo Standing Committee members (PPSC) in 2012.[11] We chose this list for two reasons. First, compared with lower-ranking officials, such as prefectural-level leaders, the educational background and work experience of provincial leaders are more likely to overlap with those of national leaders. Second, it is composed of PPSC members who were in their positions just before the anti-corruption campaign. The political outcome is thus unexpected and exogenous as choosing that year avoids possible influence from the campaign itself. For example, the newly appointed PPSC members on or after the 18th National Congress are more likely to be connected with the incumbent leadership. The possibility of being investigated would then have a downward bias.

After removing the leaders in the military and stated-owned enterprises, there are 55 governmental leaders at the provincial level on the corruption list. By merging these 55 probed officials with the 2012 PPSC list, we constructed a cross-sectional dataset of 354 observations.

To code the factional ties, we followed the indicators suggested by Shih et al. (2010), which have been widely used in previous studies. Specifically, we code three binaries to describe whether a provincial official was born in the same province (*tongxiang*), graduated from the same university (*tongxue*), or worked in the same governmental unit (*tongshi*)[12] as any of the big tigers. For the CCP's incumbent leadership, we divide them into two groups: the "Xi-Wang" coalition and other central PSC members. We have also coded the same indicators to proxy the factional ties between a provincial leader and top Party leaders in birthplace, educational backgrounds, and work experience. All the statistics of these factional indicators are listed in Table 2.

## A Single-Equation Probit Model

Our goal is to test whether one's relationship to the incumbent Party's leadership affects the likelihood of being investigated. One approach is estimating a single equation with all the factional indicators on the right-hand side and the binary of being investigated on the left

[11] We exclude the directed-controlled municipalities, as well as Xizang province (Tibet). On average, each province is equipped with 10-13 PPSC members, including a Party secretary, a governor, a chairman of the provincial Chinese People's Political Consultative Conference (CPPCC), a provincial administrative secretary, a local military representative and the heads of important departments. In our data, the military representatives are excluded. Ideally, it would be best if we could collect the information for all provincial leaders, not only the PPSC members. However, there is no complete list containing all the names. Moreover, for many provincial leaders other than the PPSC members, their published resumes are incomplete or even missing.

[12] Having worked in the same "xitong" is not on its own counted as an overlap in work experience. For example, the head of the Provincial Politics and Laws Committee (PLC) is not considered to have overlapping experience with Zhou Yongkang unless he also served in the central PLC. Similarly, experience in the Communist Youth League cannot guarantee overlap with Ling Jihua or Li Keqiang unless the official once served in the central Youth League.

(Shih et al., 2010, 2012; Jia et al., 2015; Arcand et al., 2015). If the indicators connected with the current Party leaders are significantly negative, we can confirm the existence of self-protection (i.e., the Party's top leaders are protecting their own followers).

Table 3 lists the estimation results from a standard probit model. The dependent variable is a binary that equals one if a provincial leader is probed by the central government. The independent variables include all the factional indicators. For each provincial leader, we also control for his/her age, gender and the administrative rank. The fixed effect at the provincial level is considered. As shown, all the indicators connected with the incumbent Party leaders do not significantly affect the probe odds. Even for Xi Jinping and Wang Qishan, we do not have any evidence that they are protecting their own followers. On the other hand, sharing two factional indicators with big tigers (birthplace ties and work experience ties) increases the possibility of being probed.

However, this single-equation probit model has some flaws. First, we have no idea whether the factional indicators are effective to proxy the real political connection. The statistical significance can only tell us the correlation between factional indicators and probe odds, but we skip an intermediate step testing whether the indicators successfully predict a patron-client relationship. Second, we question whether the model has well described the procedure for deciding to investigate. Prior to conducting a probe, it is quite possible that President Xi Jinping has enough information to judge whether a provincial leader is a follower of the "big tigers". In other words, unlike us, he does not need to infer the factional backgrounds based on provincial leaders' birthplaces or work experience. Third, although the single-equation probit model estimates the marginal effect of each factional indicator, it doesn't indicate the overall intensity of the political purge.

In short, we prefer to use factional indicators to predict the strength of the connection between a provincial leader and a national leader. The decision to conduct an investigation should be made by the strength of the connection, not by factional indicators. In this paper, we created a recursive selection model that satisfies these requirements.

## A Recursive Selection Model

Suppose that $y_1^*$ and $y_2^*$ are two latent variables. A provincial leader is *reported* to be a factional member of any big tiger if and only if $y_1^* > 0$. $y_1$ is a binary variable that equals one if the factional connection is reported by the media; otherwise, it equals zero. The decision-maker conducts an investigation of a provincial leader if and only if $y_2^* > 0$. $y_2$ is a binary variable that equals one if the provincial leader is under investigation; otherwise, it equals zero.

$x_1$ is a set of factional indicators representing the ties between a provincial leader and the big tigers, including whether they were born in the same province (*tongxiang*), graduated from the same university (*tongxue*), or worked in the same governmental unit (*tongshi*). $x_2$ is the same set of indicators of the provincial leader but compared with incumbent Party leaders. If the anti-corruption campaign is an intra-elite battle, the indicators contained in $x_2$ are expected to decrease the possibility of being probed. Other than factional ties, $x_2$

also includes age, gender, and administrative rank of each provincial leader. Squared age is added for the non-linear effect.

For the provincial leader $i$, we have

$$y_{1i}^* = \beta_1 x_{1i} + \epsilon_{1i} \tag{1.1}$$

$$y_{2i}^* = \beta_2 x_{2i} + \gamma y_{1i}^* + \epsilon_{2i} \tag{1.2}$$

$$y_{2i} = \mathbf{1}(y_{2i}^* > 0) \tag{1.3}$$

$$y_{1i} = \mathbf{1}(y_{1i}^* > 0)\mathbf{1}(y_{2i}^* > 0) \tag{1.4}$$

$$\epsilon_{1i} \sim N(0,1), \epsilon_{2i} \sim N(0,1), cor(\epsilon_{1i}, \epsilon_{2i}) = \rho \tag{1.5}$$

Equation (1.1) follows the conventional view in elite politics that political connections are determined by factional indicators. The latent variable $y_{1i}^*$ represents the connection strength between the provincial leader and the big tigers. $\beta_1$ is used to test the validity of the indicators. If $\beta_1$ is significantly positive, the indicators - overlaps in birthplace, educational background, and work experience - can efficiently proxy the real (reported) patron-client relationship.

Equations (1.2) and (1.3) jointly describe the decision to conduct probes. $\beta_2$ measures the effect of factional ties with the incumbent Party leaders on the likelihood of being investigated. If the factions are protecting their own members, $\beta_2$ should be significantly negative. In equation (1.3), $\gamma$ represents the overall tendency to purge the big tigers' followers. For a positive $\gamma$, a provincial leader is more likely to be probed if he links to the big tigers more tightly.

Equation (1.4) indicates the selection problem. Before an investigation is announced, the legal documents are not available and few authoritative media will follow the rumors. Moreover, only after the central disciplinary agency posts the case can journalists report without worrying about possible revenge from the investigated official. Therefore, connections to the big tigers can be observed only if an official has been probed by the central government, which requires $y_{2i}^* > 0$. Obviously, finding a reported patron-client relationship also requires the latent connection to be strong enough ($y_{1i}^* > 0$).

The above-proposed model looks very similar to the selection model suggested by Heckman (1979) or the bivariate-probit selection model suggested by Van de Ven and Van Praag (1981). But, in our model, the "recursive" problem occurs when the outcome of equation (1.1) is contained in equation (1.2). That is, an official is reportedly connected with the big tigers partially because he has been investigated; however, whether he is investigated recursively depends on how strongly he is connected with the big tigers. This special selection process causes difficulties in identifying parameters. Intuitively, suppose that a provincial leader is connected to the big tigers not due to factional reasons but due to some unobservable factors (i.e., $\epsilon_{1i}$ is expected to be large). When we plug the first equation into the second, the effect of unobservable factors is amplified by the purge tendency $\gamma$. Since the new term $\gamma\epsilon_{1i}$ is not necessarily orthogonal to $x_{2i}$, the coefficient set $\beta_2$ is not identifiable.[13] That is to say, the single-equation probit model we used before cannot provide reliable estimations.

[13]More specifically, the true error term in the selection equation is $\gamma\epsilon_{1i} + \epsilon_{2i}$. If equation (2) is solely

Conventional technologies such as the Heckman two-steps and the Van de Ven's method cannot solve this issue. In this article, we adopt the full-information maximum likelihood estimation (FIML). The log-likelihood function is constructed from the joint distribution of $\epsilon_{1i}$ and $\epsilon_{2i}$. With the FIML, all of the parameters can be identified (refer to Appendix A).

Aside from providing a convincing estimation of the likelihood of being probed, this simultaneous model offers two additional bonuses. First, equation (1.1) helps to double-check whether the conventional indicators affect the establishment of a patron-client relationship, particularly to the big tigers. Second, the estimation of $\gamma$ represents the political purge tendency. It measures the marginal increment in the possibility of a probe along with the change in connection strength to the big tigers. Although the existence of political purges is an accepted fact, our model is the first to quantify this in statistics.

## Estimation Results

As previously mentioned, we divided the Party's leadership into two groups: the "Xi-Wang" coalition and the other four CCP PSC members.[14] In practice, we estimate the model twice, using the factional indicators of the two groups respectively. Estimation results can be found in Table 4. Robust standard errors are reported at the prefectural level.[15]

The estimation for $\beta_1$ shows that for except the overlaps in educational backgrounds, the other two indicators (being born in the same province, having working in the same governmental unit) are proven valid proxies for a patron-client relationship between provincial leaders and the big tigers. This supports us repeatedly using the same set of indicators as proxies for connection with other top leaders.

Our second finding is strong evidence of a political purge (i.e., $\gamma$ is proved to be significantly positive). This means that, when a decision-maker starts a new case, someone who comes from the big-tiger factions has a higher possibility of being probed. The positive $\gamma$ is consistent with the fact that the factions of Zhou, Ling, and Su having been crushed, so the anti-corruption campaign does appear to be a political purge.

We are most interested in the attitudes taken by other (incumbent) Party leaders. According to the previous analysis, there are two possibilities. First, if the anti-corruption campaign were indeed a factional struggle, the top incumbents would protect the people close to them. Or, if the corrupt coalition threatened the authoritarian regime, they would be expected to unite behind Xi. Self-protection would hence be limited. In Table 4, none of the factional indicators - whether connected to Xi and Wang or to other PSC members - has a significant effect. In other words, there is no clear evidence of self-protection.

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estimated with the standard probit technology, the unknown parameter $\gamma$ will show up in the denominator of the standardized $\beta_2$, and the identification is impossible (refer to Appendix A).

[14] Liu Yunshan, minister of the CCP's central Propaganda Department, is not taken into account because he has no experience in local offices.

[15] Using robust standard errors allows for the unbalanced distribution of probe cases across the country. Provinces, such as Sichuan, Jiangxi, and Shanxi which are more closely linked to the big tigers have more probes than others.

Moreover, our findings clear the question mark hanging over Xi Jinping and Wang Qishan. They are believed to be the initiator and executor of the anti-corruption campaign, but they didn't use their influence to protect their own followers. Our findings are consistent with Francois et al. (2016). They tested how general factional backgrounds[16] (not individual connections) affect the investigation odds, showing a remarkable factional balance among the fallen officials.

As a result, we favor the assumption that all top CCP leaders actually stand on the same side with President Xi. Rather than factional warfare, the anti-corruption campaign appears to be a joint effort in removing the purged factions with the tacit understanding of the others. This concerted action implies that, in others' eyes, the big tigers have become regime troublemakers. In the next section, we will show that these troubles may be related to promotion patterns at the lower levels of government.

## 1.4 Behind the Political Purge: Meritocratic Concerns

To deny rumors that the anti-graft fight was no more than power struggle, Xi Jinping declared his motivation more than once in public speeches. In the first meeting of the Party's Politburo after Xi ascended to power, he described corruption as so severe that if unchecked it would "inevitably lead to the downfall of the Party and the state". In September 2015, Xi combatted the rumors again. During his visit to the United States, Xi claimed, "[T]here is no *House of Cards* ...[;] the campaign was launched to meet people's demands."

If Xi is sincere, and the anti-corruption campaign is an effort to save the Party, why does the Party need saving? Moreover, we have shown that all of the Party's top leaders have limited self-protection and stand on the same side to support the anti-graft fight. So, what is the real threat the Party is facing?

One possible explanation is the pressure from slowing economic growth. In this paper, we do not directly link anti-corruption efforts to economic development, partly because the relationship between corruption and growth is still unclear,[17] and partly because the

[16] They test how having backgrounds as members of the Communist Youth League, as members of the Shanghai gang, and as princelings affected probe odds. They did not find significant correlations between any of them.

[17] The histories of Guinea-Bissau and the Philippines provide examples of how authoritarian parties failed due to economic collapse (Smith, 2005). On the other hand, the comparative political experience in Malaysia provides opposite examples (Slater, 2003). Admittedly, China's economy has slowed down during the past two years, but there is heated debate over whether corruption or anti-corruption is responsible for the drop (Qian and Wen, 2015). Anti-corruption could help economic growth because rent seeking distorts resource allocation; however, corruption may correct inefficiencies (Rose-Ackerman, 1999; Yang, 2004). For instance, it could provide private sectors with the convenience of skirting tedious administrative approval (Leff, 1964; Levy, 2007). In many cases, corruption is a second-best solution when a market is heavily distorted. Under the circumstances, a sudden eradication of corruption from the economy may not definitely lead to a positive end.

campaign is still in progress. Instead, we focus on the possible meritocratic concerns behind the appearance of a political purge. On one hand, meritocracy helps smooth necessary economic reforms and hence future economic stimulation. On the other hand, if the Party cannot defend the rules of internal promotion, it will lose control of the political hierarchy and the Party's autocracy will collapse from within. In this section, we will show that before the anti-corruption campaign, the purged factional leaders had severely violated political meritocracy within their spheres of influence.

## Meritocratic Promotion Patterns

A narrow understanding of meritocracy links promotion solely to officials' abilities to develop the economy. Previous literature suggests that China's governance structure is shaped in an "M-form", with comparable economic performance among jurisdictions (Maskin et al., 2000; Qian et al., 2006; Xu, 2011). China's rapid growth results from a competitive promotion system in which local officials compete in economic outcomes for the chance at promotion. Many studies have examined the correlation between economic growth and political turnover. They find that better economic performance, especially a higher GDP growth rate, is associated with a greater possibility of being promoted (Li and Zhou, 2005; Chen et al., 2005; Choi, 2012). Although the evidence is mixed regarding the promotion of senior officials at or above the provincial level (Tao et al., 2010; Shih et al., 2010; Arcand et al., 2015), studies have confirmed the existence of meritocracy at lower levels, such as prefectural cities and townships (Guo, 2009; Landry et al., 2015; Chen and Kung, 2016).

Other than rewarding economic development, the Party shows a preference for officials with certain specific work experience. One example is the Communist Youth League (CYL). The Youth League is regarded as the Party's reserve army, whose members are mostly teenagers. Since the 1990s, officials hailing from the CYL have moved up faster into the elite ranks.[18] Among those in equivalent positions, CYL members have been found to be much younger than other officials (Kou and Tsai, 2014; Shih et al., 2012; Arcand et al., 2015; Opper et al., 2015). In addition to the Youth League members, the Party also prefers officials with work experience in upper-level offices. For instance, prefectural-level (city) leaders have been found to be promoted more often if they have worked in the General Office or other relevant units at the provincial level (Kou and Tsai, 2014; Arcand et al., 2015; Yao and Zhang, 2015).

Some studies interpret these patterns of promotion in a clientelistic way. They argue that officials with those specific backgrounds may establish connections to certain patrons such as top CYL leaders or provincial governors (Shih et al., 2012; Arcand et al., 2015). In this paper, we have reservations about this interpretation. Nathan (1973) defines the patron-client relationship as the connection established between a subordinate and a clearly

[18]Before the 18th National Congress, over half of the provincial party secretaries, including Hu Chunhua, Wang Yang, Sun Chunlan, Zhou Qiang, Lu Hao, Zhao Leji, Li Zhanshu, Liu Qibao, and Yuan Chunqing had worked at the CYL in the 1980s and 1990s (Tsai and Kou, 2015). At the national level, the former president, Hu Jintao, the current premier, Li Keqiang, and the former chief of the Party General Office, Ling Jihua, all were in charge of the CYL before they assumed office.

identified supervisor. Nevertheless, working in a certain unit does not mean that we can confirm which supervisor is the patron. Moreover, it is not certain whether past patrons can influence current promotions. For example, suppose there is a prefectural-level leader who worked in the provincial General Office ten years ago. Since the General Office serves the entire provincial leadership, it is not clear which provincial leader would be considered as the patron. Even if we confirmed which provincial leaders was the patron, for reasons such as death or retirement, it would questionable whether the patron could still carry weight in the city leader's promotion ten years later.

In this paper, we analogize the special work experience (hailing from the Youth League or working in upper-level offices) with on-the-job training and rotation programs which are widely adopted by private firms. These programs are thought not only to increase labor productivity (Bartel, 1995), but also to reduce asymmetric information by allowing employers to learn more about individual worker's strengths (Ortega, 2001; Eriksson and Ortega, 2006). Making an analogy to a private firm, the Chinese Communist Party brings promising officials together and places them in high-level offices to cultivate their comprehension of governing skills. Then the Party reassigns them to local jurisdictions. Just like firms sending employees to MBA programs and paying for them (Acemoglu and Pischke, 1999), rotating the CYL members and upper-level officials to local positions fosters their abilities to solve specific socioeconomic problems, including attracting investment and maintaining social stability (Kou and Tsai, 2014). Compared with local officials who never worked for higher-level units, reassigned officials have experience working at different levels. Thus, it is not difficult to understand why officials hailing from the Youth League or upper-level units are more often promoted.

Bell (2015) generalizes the definition of political meritocracy to be when officials are promoted because they are able to help the Party "get things done". In this paper, promoting both those with outstanding GDP growth rates and those with special working backgrounds are considered to be meritocratic patterns. We will show that, before the anti-corruption campaign, these meritocratic patterns were blocked in the provinces under the control of the big tigers.

## Provinces Controlled by the Big Tigers

Table 5 lists the units that the three big tigers took charge of prior to the anti-corruption campaign, including provinces, ministries, and state-owned enterprises. For each unit, we report the number of probed officials who once worked there. As shown in the Table, three provinces - Sichuan, Shanxi, and Jiangxi - have the highest number of probes.[19]

[19]Though Zhou left the head position in Sichuan province ten years ago, a group of provincial leaders remained there to help him influence local issues. Seven such agents of Zhou have been investigated in the anti-corruption campaign. In spite of having no local work experience, Ling Jihua retained influence in his home province through a semi-formal organization: "Xishan Hui". This organization selects members who were born in Shanxi province according to strict requirements. Moreover, his brother was a vice chairmen of the Shanxi CPPCC, who was a perfect intermediary linking local leaders to Ling Jihua. Compared with

Compared with other provinces, Sichuan, Shanxi and Jiangxi are also the most severely afflicted areas. Figure 3 arranges all of the provinces according to the number of the targets at the provincial level (sub-provincial leaders or above, up to September 2015). As shown, Shanxi, Sichuan, and Jiangxi top the list. In the network diagram of Figure 1, about 60% of the probes whose last position was in one of these three provinces can be found in the central cluster, and over a half of the officials in the cluster used to work in these three provinces. In this paper, we divide all the provinces of China into two groups. Group I contains the three provinces controlled by the big tigers, and Group II contains the rest.

## A Dataset of Prefectural-level Leaders

To compare the promotion patterns between the two groups of provinces, we constructed a data set of prefectural-level (city) leaders in China. Because of the Party's dual-leadership, we record the city leaders as both Party secretaries and mayors. The data period is between 2006 and 2012 - before the anti-corruption campaign was launched, when the three big tigers were still in power.[20] The reason for choosing this period is that we can avoid possible interference from the later campaign, which might affect assignments and the behavior of local officials.

To make the promotions independent from the anti-corruption campaign, we only selected city leaders who served full terms within the chosen period (i.e., their terms started no earlier than 2006 and ended no later than 2012). Similar to many other studies of the cadre-evaluation system (Li and Zhou, 2005; Jia et al., 2015; Chen and Kung, 2016), personal information for the city leaders was collected from their online curriculum vitae, addressing age, gender, work experience, and tenure information. For each leader, we take his whole tenure period as an observation. A city leader was allowed to appear repeatedly in our data if he or she served multiple complete terms in different positions.[21] The provinces of Xinjiang and Xizang (Tibet) were not included due to a lack of available data.

Promotion for a city leader is defined as a change in administrative rank when his or her term ends. For example, if a city leader on the bureau level (*tingju ji*) is moved to a sub-provincial or a higher-level unit, it is considered a promotion. If the transfer does not change the leader's administrative rank, the turnover is coded as zero and not considered a promotion. There are two exceptions. First, it is a general understanding that in the dual-leadership of Chinese prefectural cities, a Party Secretary is more powerful than a mayor. Thus, moving from mayor to city's Party Secretary is considered a promotion although there is no change in administrative rank (Li and Zhou, 2005; Arcand et al., 2015). Second, in

Zhou and Ling, the case of Su Rong is relatively simpler. He was in charge of the Jiangxi province as the Party secretary from 2007 to 2012.

[20]Zhou was a member of the CCP Politburo Standing Committee; Ling was the director of the General Office of the CCP Central Committee; Su Rong was the party secretary of Jiangxi province.

[21]For example, a city leader shows up twice in our data if he or she was a mayor between 2007 and 2009 and then became a mayor in another city between 2009 and 2011. Or he could be the party secretary in any city after 2009 as long as the second term finished no later than 2012.

the year 2010, the Central Organization Department selected 63 young- and middle-aged local officials to assume posts in central ministries. Six of the selected officials were Party secretaries or mayors at that time. Because the selection process was very competitive,[22] we also treat those six cases as promotions.

Table 6A shows the summary statistics on demographics, career paths, turnovers, as well as local economic growth for city leaders in the two groups. The p-values from the two-sample t-test are listed in the last column. Compared with Group II, the promotion rate in Group I - the three targeted provinces - was lower by 10%. Except gender and overlapping work experience with PPSC members, there is no significant difference between the two groups of provincial officials in other variables.

## Empirical Tests for Political Meritocracy

To compare meritocratic promotion patterns between Group I and Group II, we exploited a standard OLS model

$$promotion_i = \alpha_0 X_i + \alpha_1 G_i + \alpha_2 X_i \star G_i + \theta Z_i + \phi \mu_p + \varepsilon_i$$

where $promotion_i$ is a binary variable that equals one if the $ith$ turnover in the sample meets our definition of promotion; otherwise, it equals zero. $X_i$ represents meritocratic promotion patterns, including higher GDP growth rates and the specific working background of hailing from the CYL or having worked in upper-level units. $G_i$ is a binary variable that equals one if the $ith$ observation comes from the three provinces of Group I (i.e., the provinces controlled by the big tigers); otherwise, it equals zero. To compare the promotion patterns between groups, we add an interaction term for the meritocratic patterns and the group indicator ($X_i \star G_i$). If $\alpha_2$ is significantly negative, promotions in Group I did not adhere to meritocracy as tightly as in Group II. $Z_i$ is a set of individual controls that affect promotion odds, including age, gender, term length (tenure), position type (Party Secretary or city mayor), and city level.[23] $\mu_p$ is added to control the fixed effect at the provincial level. $\varepsilon_i$ is the error term.

## GDP Performance and Promotion Odds

To measure a city leader's performance in developing the local economy, we average the annual GDP growth rates of the years in the leader's term and compare him or her with peers in the same province. The average GDP is weighted with the number of months the leader held the position each year. To be more specific, assume a city leader's term started in September 2007 and ended in February 2009. Suppose the city's GDP growth rates between 2007 and 2009 were 10%, 9%, and 8%, respectively, and the corresponding provincial average rates were 7%, 6%, and 7%. Since the leader stayed in this position for three months in 2007,

[22] Finalists must be nominated by a provincial board and win a multi-candidate election.

[23] City level is a dummy variable. It equals one if the city is a provincial capital; otherwise, it equals zero.

12 months in 2008, and another two months in 2009, the relative GDP growth rate is then computed as $(10-7)\star 3/12+(9-6)\star 12/12+(8-7)\star 2/12=4.17(\%)$.

Figure 4 illustrates the Lowess Smoother for the two groups of provinces. In the three provinces controlled by the big tigers (Group I), promotion odds and relative GDP performance present a negative correlation. By contrast, in the other provinces (Group II), higher GDP growth rates are associated with higher promotion odds. The regressions results are reported in Table 7. We find a positive correlation in the whole sample between GDP and promotion. However, consistent with the Lowess Smoother, the first two columns of Table 7 show that the correlation disappears in Group I but becomes stronger in Group II. Thus in this model, prior to the anti-corruption campaign, GDP performance didn't help promotion in the provinces controlled by the big tigers but did help promotion in the other provinces.

The coefficient before the interaction term in columns 3 and 4 is negative but not significant. One reason reducing the significance is the effect of outliers. As shown in Figure 4, certain cities in Group II with very low growth rates construct an interval where the predicted curve is sloping downward. Also, the curve for Group I turns upward sloping at the right, similarly because of the few observations with highest growth rates. To avoid the noise from outliers, we cut off the top 5% and lowest 5% in relative GDP growth rate for both groups, retaining only the observations between the 5th percentile and the 95th percentile. In Table 7, columns 5 and 6 report the estimation results. In addition, we compared the three hardest-hit provinces with the "least corrupt" provinces. In the left panel of Figure 3, the provinces of Group I appear at the bottom; these are the provinces having the most provincial officials charged with corruption. We selected for the new comparison group the provinces at the other end of the spectrum where each has no more than two provincial leaders under probe. The estimation results are listed in the last two columns of Table 7.

As shown, the significance of the interaction term now has been improved. The correlation between promotion odds and economic performance was much weaker in the three hard-hit provinces. The difference in enforcing meritocracy becomes more prominent if we filter out the "least corrupt" provinces for comparison, which implies that the level of effort in probing corrupt officials is consistent with the level of enforcement of meritocracy. Prior to the anti-corruption campaign, the big tigers departed from the norm of rewarding economic development. It is a possible reason why they have been removed.

## Specific Working Backgrounds and Promotion Odds

As discussed, a prefectural-level leader is considered to be strategically trained and rotated if he ever worked in the Youth League (CYL) or in important units at the provincial level. Table 8 reports the correlation between these backgrounds and promotion odds. Three dummies are coded to represent 1) if a city leader hails from the Youth League (at or above the provincial level), 2) served provincial General Offices, or 3) worked in other provincial units.

As the table shows, in the three hardest-hit provinces controlled by the big tigers (Group I), we find no positive correlation between background and promotion odds. Furthermore,

before the anti-corruption campaign, a city leader in Group I was less likely to be promoted if he had worked for the provincial General Office. By contrast, the same experience significantly helped promotion in other provinces.

Although there is no clear effect from CYL experience when we run the regressions for each group separately, the interaction term in the last column is significantly negative. Unsurprisingly, the interaction of experience in the General Offices is also significant. The only exception is experience in other provincial units, though the interaction coefficient is very close to the significance threshold (t-value = 1.60). The estimation results suggest that, compared with other provinces, the big tigers less often preferred those city leaders who had been trained or rotated by the Party. It is another example of their departure from existing meritocratic norms.

Supporters of factionalism would argue that the specific working backgrounds imply a patron-client relationship between a city leader and provincial leaders, and that it is this relationship - not working experience - that leads to promotion. To exclude this possibility, we coded the connections between each city leader and the provincial leaders - the provincial Politburo Standing Committee members (PPSC) - with the same set of factional indicators used before. We then tested whether these factional indicators affected promotion odds at the prefectural level before the anti-corruption campaign. Estimation results are reported in Table 9. We do not find any significant effect from either the factional indicators or the corresponding interactions. None of the education ties (*tongxue*), birthplace ties (*tongxiang*) or work experience ties (*tongshi*) helped a city leader's promotion. Also there was no significant difference between the two groups of provinces.

In Section III, we have shown how factional indicators effectively predict connections between provincial leaders and national leaders. However, many studies point out that promotion patterns at lower levels are more meritocratic (Guo, 2009; Landry et al., 2015). Our findings confirm this point. Connections to provincial leaders do not necessarily help promotion for prefectural-level leaders.

In this paper, we argue that officials hailing from the Party's on-the-job training or rotation projects are superior in governing ability and are more faithful to the regime. Promoting officials with such backgrounds embodies the requirements of political meritocracy. However before the anti-corruption campaign, the big tigers didn't value these people the same as other provinces. Again, this departure from the norms of political meritocracy is proven to correlate with the purge of the big tigers and their followers.

## Corruption and Promotion Odds

Up to now, our analysis has been limited to discussion of what happened before the anti-corruption campaign started. We have shown that departure from meritocratic norms is associated with the level of effort in anti-corruption. The hardest-hit provinces are the regions where political meritocracy was severely undermined. In those provinces, neither economic performance nor experience in the Party's training and rotation projects could

increase promotion odds. If political meritocracy was abandoned in those provinces, then what type of officials were favored and promoted?

In the case of Su Rong, one of the three big tigers, the Party's disciplinary agency emphasized his wrongdoing by using the phrases "liberally sold offices for cash" and "severely poisoned the local political environment". Regarding the other two big tigers, Ling's elder brother was accused of "providing convenience for others' promotion", and similar wording is repeatedly used in the inspection reports of the followers of Zhou. Thus, a reasonable hypothesis is that in the provinces controlled by the "Big Tigers", corruption had replaced meritocracy in promoting officials.

To test the correlation between corruption and promotion, an initial possibility would be to check whether the city leaders under investigation were more likely to be promoted than others. However, this idea is flawed. A city leader was possibly probed simply because he was indeed corrupt, or maybe because he was an important follower of Xi Jinping's political rivals. So the official's targeting does not necessarily mean he was corrupt. In this paper, instead of considering the city leaders, we generate an index to proxy the overall corruption intensity of each city. Specifically, for a certain city leader, a corresponding "local corruption intensity" is defined as the number of probed officials who worked in the same city in his term. If there were many officials charged with corruption, the local political environment should have been less healthy than in comparable cities. To show the validity of this index, we have cross-checked with the World Bank's Enterprise Surveys database. In Appendix B, we prove that the number of corruption incidents in a city is consistent with enterprises' perceptions of corruption in that city.[24]

Table 10 reports the estimation results. We find that in the three hardest-hit provinces, a higher level of local corruption intensity significantly increases the promotion likelihood of city leaders. On the contrary, this correlation disappears in other provinces. For robustness, we generated an alternative index of local corruption intensity by excluding the city leader from the total number of probes. The results are still robust.

In short, we have tested the meritocratic patterns for promotion, as well as the effect of local corruption intensity, prior to the anti-corruption campaign. The following table summarizes our findings, comparing the patterns between the two groups of provinces. For the three hardest-hit provinces controlled by the big tigers (Group I), both the relative GDP growth rate and specific working backgrounds didn't help promotion, but a corrupt political environment did. By contrast, the other provinces (Group II) tightly adhered to political meritocracy, and corruption had no influence. It appears that, while most provinces rewarded performance and pedigree, in the provinces of Sichuan, Shanxi, and Jiangxi promotion became divorced from both. Instead, the best path to promotion was enthusiastic participation in the corruption network or toleration of the corrupt officialdom. The key factor leading to the purge of top leaders and their networks in these three provinces may

[24]In this article, we do not choose the World Bank's database as the proxy of local corruption intensity because the sample size of that survey was very small, covering only 23 prefectural cities. However, the correlation between firms' perceptions of corruption and the number of corruption cases is nevertheless significant and robust.

have been their departure from existing norms within the Party. By removing these factions from the system, the Party will legitimize its rule and strengthen its governance.

| | Correlation with Promotion Odds | |
|---|---|---|
| | Group I | Group II |
| Relative GDP growth rate | Negative | Positive |
| Specific workingback grounds | Negative | Positive |
| Local corruption intensity | Positive | No effects |

## Promotion and Probe Likelihood

We have shown how meritocratic upward mobility was hindered in provinces controlled by the big tigers. These provinces are also the focuses of the anti-corruption campaign. However, we are not sure whether the probed city leaders are the same ones who violated political meritocracy. If the anti-corruption campaign has the goal of correcting the personnel management system and legitimizing its rule, those officials who were not qualified for promotion (based on political meritocracy) but were promoted anyway should be more likely to be targeted.

In this paper, we define a city leader as one who does not match meritocratic patterns if he satisfies both of the following conditions:

Condition I: The relative GDP growth rate was below the 40th percentile of the entire sample.

Condition II: The official did not work for the provincial General Office.

We choose the 40th percentile as the threshold for GDP growth rate because before the campaign the average promotion rate was 55% at the prefectural level. If the performance of a city leader were lower than the 40th percentile, he would not receive a promotion if meritocracy were strictly enforced.[25] Work experience in the provincial General Office was selected as a representative of the Party's training and rotation projects because it affects promotion odds the most between the groups of provinces.

For this equation, we used the same data set for prefectural leaders. The OLS model specification is given by

$$probe_i = \theta_1 TYPE_i + \theta_2 promotion_i + \theta TYPE_i \star promtoion_i + \lambda Z_i + \varphi \mu_p + \varepsilon_{ip}$$

The dependent variable $probe_i$ is a binary variable that equals one if the $ith$ city leader has been announced to be under investigation by the central government. $promotion_i$ has the same definition as before, and it is also a binary variable indicating whether the city leader received a promotion after finishing his term.

[25] We also tried some other thresholds including the 50th percentile and the 25th percentile. The results are not listed in this paper but they were robust.

"TYPE" is a dummy that equals one if the city leader matches both conditions I and II. The interaction equals one if a city leader received a promotion but didn't match the meritocratic patterns (i.e., the promotion was "unexpected"). The model specification follows a standard difference-in-difference form. measures the pure effect of "unexpected" promotion on probe odds. In an alternative specification, we deleted the first two terms and only left the interaction to compare the probe odds of those "unexpectedly" promoted with all the others. $Z_i$ is a set of controls of the individual characteristics. $\mu_p$ is the provincial fixed effect. For the city leaders repeatedly showing up in our sample, we consider their first position. In other words, we organized the data based on individuals instead of positions.[26] The statistics of this individual-based data can be found in Table 6B.

Results are reported in Table 11. We find that in all specifications the coefficient of the interaction is always significantly positive. That is to say, if a city leader were "unexpectedly" promoted before the anti-corruption campaign, he would more likely be charged for corruption in the campaign.

## 1.5 Discussion and Conclusions

An effective hierarchical apparatus to assign services and benefits is critical to maintaining the internal political order of authoritarian regimes (Svolik, 2012). Political meritocracy is assumed to be such an apparatus for the Chinese Communist Party. The Party selects future leaders based on their loyalty and governing abilities. This is the Party's successful experience over the past decades. Now China is facing serious social and economic problems. To continue the reforms' success, more than ever, the Party needs a group of officials who can efficiently implement its policies and decrees. The current anti-corruption campaign of China embodies that need.

Several top leaders have been brought down together with their followers. Unlike the critics who assume the anti-corruption campaign is a struggle for power, we argue that the Party's motivation is to save autocracy by developing an effective meritocratic governing system. It is worth emphasizing that we are not denying the active roles of factions. More precisely, all of the evidence suggests that the Party allows top leaders to cultivate personal influence and construct their own factions. However, the way of picking followers must support the principles conducive to maintaining the Party's rule, and political meritocracy is one of these principles. If a factional leader promotes officials for personal interests but disregards their governing ability and loyalty to the regime, the majority will expel that leader from the system.

Our paper also contributes to the debate about meritocracy and factionalism. We have shown that meritocracy may be undermined by a stronger individual preference for corruption in some parts of China. Many studies have tested the assumption of meritocracy but

[26]The reason is that, no matter how many positions a city leader served before the anti-corruption campaign, there is no variation in the dependent variable $probe_i$.

neglected regional differences. Their problem is mistakenly omitting the heterogeneity of factional leaders. It is therefore not difficult to understand the inconsistent results of previous empirical work.

Finally, though we do not agree with simplifying the anti-corruption campaign to a power struggle, we do not deny that Xi Jinping may have taken the opportunity to cultivate his own power. Commentators have noticed that, after removing corrupt officials, Xi has filled vacant senior positions with people who are close to him. However, we do not have enough evidence to show that this was Xi's original motivation. It is possible that the officials promoted recently better match the meritocratic patterns (i.e., they are more capable, more faithful, and less corrupt). If that is true, the recent promotions indicate sincere concerns but not a power struggle. In the future, when we can observe the performance of these newly promoted officials, the picture will then become much clearer.

# Chapter 2

# Greasing the Wheels of Economy: Corruption or Anticorruption? Evidence from China's Residential Land Market

## 2.1 Introduction

Many economists believe that corruption results in resource misallocation and efficiency loss. Overwhelming evidence suggests that corruption reduces firms' income, impede foreign direct investment, and distort public expenditure (Tanzi and Davoodi, 1997; Wei, 2000; Méon and Sekkat, 2005; Fisman and Svensson, 2007; Javorcik and Wei, 2009). Macrolevel studies have found that corruption reduces national economic growth and creates poverty traps (Mauro, 1995; Mo, 2001; Gupta et al., 2002; Aidt, 2009). However, if corruption only results in inefficiency, one must consider why it widely exists in the economy without being corrected.

One possible reason is market failure. When corruption prevention would be too costly, the government must tolerate it to enable smooth implementation of policies; in other words, corruption is the unavoidable cost of correcting market inefficiency (Acemoglu and Verdier, 2000). Furthermore, corruption could also be a positive factor in that it offers a "second-best world": when an economy has a low outcome owing to some preexisting distortions (for example, a monopoly or price control), corruption is a common way of alleviating the resulting shortage. There are two reasons for this. First, corruption can stimulate economic activity that would have otherwise not occurred (Leff, 1964). Second, corruption can help the private sector circumvent red tape and reduce trading costs (Huntington, 1968; Lui, 1985; De Vaal and Ebben, 2011). In both situations, the market outcome can increase and approach the socially desired level, resulting in improved efficiency. For example, in the 1960s, Georgia's Soviet-style economy led to serious shortages. Corruption partly solved this problem by clearing the markets through unofficial prices and bribes. Georgia's endogenous

black markets, though illegal and corrupt, greased the wheels of an economy that lacked a free market (Levy, 2007).

Nonetheless, few studies have tested the "greasing-the-wheels" hypothesis at the microlevel. There are several reasons for this. First, measuring corruption is difficult. In macrolevel studies, a convenient method for measuring corruption is choosing from various available cross-national indices [1]. However, microlevel studies require more detailed information, for example, the estimated bribe payments of Ugandan firms (Fisman and Svensson, 2007)), and such data are nonexistent in standard sources (Levy, 2007). Second, the "greasing-the-wheels" hypothesis should be tested in an economic environment that contains preexisting distortions that would create the conditions for corruption to correct inefficiency; a monopoly or price control would be a good example because it results in a low starting point in terms of economic size, thereby allowing the researcher to test whether an increase in corruption increases the market output. However, finding such an economic environment is not always easy. Third, it is difficult to determine the exogenous variation in corruption. This, in turn, makes it difficult to establish the causality between corruption and economic activity. Because most previous studies have used cross-sectional data, the instrumental variable method seems best for dealing with endogeneity. Unfortunately, thus far, no instrumental variable has been able to perfectly meet the validity requirement, namely, affecting the extent of corruption but being exogenous to all unobserved determinants of economic growth (Aidt, 2009)[2].

This paper tests the "greasing-the-wheels" hypothesis in the context of China's residential land market. This market contains both corruption and pre-existing distortions. First, in China, land is state-owned; the government is the only seller on the primary market. Therefore, to maximize fiscal revenue, the local government acts as a monopoly and hoards land to push up prices[3], thereby resulting in an inevitable decrease in social efficiency (Peng and Thibodeau, 2012; Du and Peiser, 2014; Yan et al., 2014). The monopoly system also facilitates rent-seeking and corruption; local bureaucrats take bribes from buyers and, in return, offer them convenience (Su, 2008; Koroso et al., 2013; Cai et al., 2013). The only remaining problem is how the exogenous variation of corruption on the land market could be constructed.

Luckily, a possible solution lies in the anti-corruption campaign that began in China in 2012. This campaign was a political decision made by the top leaders of the Chinese Communist Party (CCP). The CCP treated this campaign as a serious attempt to fight corruption and rescue the Party's legitimacy (Manion, 2016; Lu and Lorentzen, 2016). This campaign affected bureaucrats unpredictably at all levels of government.[4] In this paper, the change in

[1]For example, Mauro (1995) and Wei (2000) both use the Business International (BI) Index. Aidt (2009) uses the World Business Environment Survey (WBES) Index.

[2]According to Aidt, neither a country's ethno-linguistic fractionalization (used by Mauro, 1995) nor the extent of national democracy (used by Gupta et al., 2002) is a good instrument.

[3]Buyers pay the government a one-off price to acquire the rights of residential land for 70 years. In this paper, "price of land" refers to this pay-off price.

[4]By September 2015, the central government had announced the names of more than 1000 people that

land-trading volume before and after China's anti-corruption campaign is quantified at the prefectural level. The "greasing-the-wheels" hypothesis suggests that corruption initiates more land transactions compared to the monopoly level. Therefore, if a city is proven to have been more corrupt before the campaign, the quantity of transacted residential land should decrease more sharply after the campaign. In other words, the "greasing-the-wheels" hypothesis could be supported if removing corruption makes the most corrupt local governments more conservative in residential land sales.

Another issue is that, to make the "greasing-the-wheels" hypothesis valid, corruption must be helpful in cutting off red tape or facilitating production activities. However, few studies have differentiated types of corruption. Previous macrolevel studies used corruption indices that do not provide any detailed information about corruption. In this paper, we categorize common corruption cases occurring in China's residential land market and differentiate corruption that facilitates production activities from other forms of corruption. We test the "greasing-the-wheels" hypothesis in terms of different types of corruption.

The rest of this paper is organized as follows. Section 2 describes how the residential land market works in China and how bureaucrats obtain personal gains through land transactions. Section 3 provides a simple model of how different types of corruption affect the land-trading volume in different ways. Section 4 describes the data. Section 5 presents the empirical results. Section 6 presents the conclusions of this study.

## 2.2 Background: Corruption in the Residential Land Market of China

Local governments play the role of both owner and administrator in the residential land market of China. They make land requisitions from the current users, sell them to real estate developers, and then supervise the follow-up development. As agents of the local governments, bureaucrats have numerous rent-seeking opportunities. Corruption in the residential land market of China can generally be split into two categories: corruption in the transaction stage and corruption in other stages beyond the transactions.

### Corruption in Transactions

In the year 2002, the Ministry of Land and Resources of China issued a regulation, making auctions the only method for selling residential land.[5] In 2006, this regulation was reemphasized and enforced.[6] Since 2008, all of the prefectural cities have adopted auctions for residential land sales. To get the land parcel he/she wants, a real estate developer must beat others with the highest bidding price. The original intent in building this auction system

were to be investigated and arrested.

[5]The Ministry of Land and Resources, http://www.mlr.gov.cn/zwgk/flfg/dfflfg/200504/t20050406_636761.htm

[6]The Ministry of Land and Resources, http://www.mlr.gov.cn/zwgk/zytz/201207/t20120723_1123654.htm

was to prevent the corruption that was taking place in land transactions. Nevertheless, local bureaucrats can easily game the system in numerous ways.

As a case in point, the corruption in the transaction stage manifests in two ways. First, a bureaucrat can benefit his colluded buyer by remising the fee reimbursements.[7] To win an auction, a corrupt bidder frequently has to bid a high price. However, he/she does not have to be too concerned with this high price since the premium part of it can be returned to him/her through various under-the-table means. One example is to reimburse the buyer for demolition. When a land parcel is sold without demolition, the real estate developer will undertake it with a reasonable compensation from the government. In practice, paying the buyer an excessive amount is a usual method of corruption. Another common case is over-compensating the buyer's investment in public infrastructure on the land. For example, in building a nursery or primary school, the colluding buyer could receive an addition amount to cover his costs. Sometimes the excuse for reimbursement has nothing at all to do with the transacted land parcel. In one such case revealed in this anti-corruption campaign, to obtain the return of excessive remising fees of some residential land, a real estate developer in the Anhui province was over-subsidized for his manufacturing projects in the same region. In reality, corrupt bureaucrats are able to initiate all kinds of schemes to return the premium that exceeds the under-the-table price. They unquestionably hide a portion of the sales revenue from the government.

The second method of obtaining personal gain during the transaction stage is by manipulating the auctions. To participate in an auction, a bidder must meet all of the entry qualifications (e.g., cash deposits, minimum total assets, total pre-tax profits, place of incorporation, etc.). One way in which bureaucrats can manipulate auctions is by setting up the requirements to purposefully filter out all of the other buyers, with the exception of the one with whom they have a corrupt deal. Another method that bureaucrats use to manipulate an auction is to choose a favorable auction form. Cai et al. (2013) ascertained that, in comparison to the English auction, a "two-stage" form (*listing*, *guapai*) allows a corrupt developer to deter entry of other potential bidders by exploiting a particular bidding strategy when the auction starts. This could explain why the "two-stage" auctions became increasingly prevalent. Another common method utilized by bureaucrats is to pressure potential bidders privately, forcing them to quit auctions "voluntarily." No matter which method is used, the competition is reduced, thereby making the "price" derived from the auctions lower than what it should have been.

In the above examples of corruption, bureaucrats hide the real price of residential land, without honestly disclosing it to the government. They make up the difference by either reimbursing more remising fees or by manipulating the auctions to reduce the competition. The hidden amount is then redistributed between the buyers and the corrupt bureaucrats. Specifically, a part of the revenue from the land sales is transferred from the public fiscal account to private purses.

[7] "Remising fees" is another expression of "land price." For residential land, this is the pay-off price of acquiring the use rights for 70 years.

### Corruption beyond Transactions

The corruption does not end when a land parcel is sold. Bureaucrats are still able to obtain personal gain by abusing the power in their hands. Most of the rent-seeking behavior beyond the transaction stage lies in the administrative approval authority. For example, after a transaction is completed, the first thing the developer does is apply for the use-rights certificate. Then, before he starts to develop the land, he has to get the project plan approved. If the developer also wants to adjust the plot ratio specified in the original lease, he must submit another application and wait for that approval as well. In the process, rent-seeking behavior is a common phenomenon that bureaucrats use to speed up the procedure and improve the passing rate for bribes.

Apart from administrative approval, local bureaucrats can impose influence on land development in numerous other aspects as well. One typical case is in assisting in the demolition. When conflicts arise between the developer and the current users, bureaucrats may act as a mediator, exerting pressure on the current users and compelling them to accept the compensation clause. Although the developer does not benefit from the reimbursement of remising fees, the support of local bureaucrats still lowers the cost that he should have been paid.[8]

Unlike in the transaction stage, corruption beyond the actual transaction does not hide the revenue from land sales. The total of the remising fees received by the local government is the exact amount a buyer pays. However, the above mentioned rent-seeking behavior eliminates unnecessary red tape, speeds up the approval procedure, and brings extra profits to the developers. Therefore, this type of corruption functions like an ex-post subsidy, which improves the buyer's surplus but, in return, corrupt bureaucrats will ask for a share as a reward.

## 2.3 Modelling Land Supply in Different Corruption Situations

In addition to pursuing personal interest, the local fiscal revenue is another factor that affects the land sales. Since the 1994 tax-reform, the local governments in China have confronted a serious disparity between fiscal power and administrative responsibilities. The central government seized most of the enterprise and value-added taxes, leaving only a small share to the local governments. Exacerbating the situation, the intergovernmental transfer received by the local governments was not sufficient to eliminate all of the asymmetry between their income and their duties. This made the revenue from land sales a critical source for the local governments in maintaining their own operations.

Among all of the different types of land, the land for residential use is regarded as the most important to the local governments. In comparison to the manufacturing and commercial industries, the capital in real estate is less likely to flow between the different

[8]For more steps of permits and certificates for a real estate project, please read the paper of Zhu (2004).

regions. Therefore, the local government has greater control power over the real estate developers in its own jurisdiction. Unlike the land for other usage (e.g., industrial land, Tao et al. (2010)), selling land for residential use provides immediate revenue to the local government. Since there is no property tax in China, for the local governments, all of the benefits from the residential land are in the remising fees from when the land is transacted. The absence of future cash flows drives up the remising fees. To some extent, this is good for the local governments because the tremendous instant rewards from the residential land can be used to solve their pressing needs in balancing the local financial deficit.

For a local bureaucrat in China, his/her political future hinges on his/her governing performance. While a certain level of public fiscal income is necessary to complete the local duties, it is also critical for his/her promotion in the future (Chen and Kung, 2016). Therefore, when a local bureaucrat sells residential land, he/she must consider both his/her personal gain and the fiscal revenue. To maximize his/her own utility, a bureaucrat must find a balance. Pursuing a significant number of bribes may not be the optimal decision, as it would decrease the fiscal revenue too much.

## Type I Corruption with Theft (Corruption in the Transaction Stage)

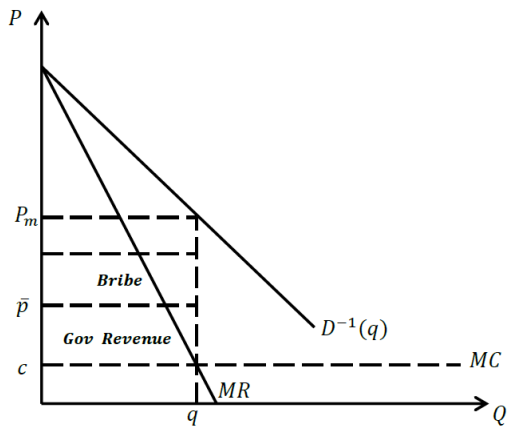
Consider a corrupt bureaucrat who negotiates with a specific buyer for a secret deal. The deal stipulates the area of land as well as the agreed price. In addition to this buyer, a large number of other identical potential buyers are also interested in the same land parcel. As required by the Ministry of Land and Resources, the land must be sold via an auction. Although the corrupt buyer must bid the highest price to win the auction, in the case of remising fee reimbursement, he/she is promised to get whatever exceeds the agreed net price.[9]

Panel A illustrates this corrupt deal. Assume that the marginal cost of supplying residential land is at some constant level ($MC = c$). For any chosen area of land to be traded, the market price from a competitive auction is given by the demand curve as $P_m = D^{-1}(q)$. The net revenue going to the local public account is the lower shaded block between the agreed price ($\bar{p}$) and the marginal cost ($c$). The loss caused by the deal is represented by the block between $P_m$ and $\bar{p}$, which is the reimbursement of remising fees returned to the buyer. Suppose that the bribe is a fixed proportion ($\alpha$) of the total reimbursement. In the graph, it is the shaded block in the middle.

The bureaucrat then maximizes his/her utility by choosing the optimal quantity ($q$) and the agreed price ($\bar{p}$):

$$\max_{q,\,\bar{p}} \qquad \lambda B + (1-\lambda)G - \frac{k}{2}L^2$$

[9]In the case of auction manipulation, the bureaucrat uses his/her political power to persuade other potential bidders to quit the auction. As a result, the corrupt buyer will get the land at the agreed price. In this case, we assume that the market value of this land is common knowledge. The potential loss in land sales revenue is determined by the gap between the potential market price and the agreed price.




**Panel A**

where $B$ represents the bribe; $L = (P_m - \bar{p})q$ is the reimbursement of remising fees, which is also the loss in fiscal revenue. Let $B = \alpha L$ $(0 < \alpha < 1)$ denote the bribe as a fixed share of the total reimbursement. $G = (\bar{p} - c)q$ is the actual net fiscal revenue received by the local government. $\lambda$ is a parameter describing the weight that the bureaucrat places on bribe versus fiscal revenue $(0 < \lambda < 1)$. The last part, $(k/2)L^2$ represents the cost of making the corrupt deal. It is a quadratic term of the total loss $(L)$ where $k$ is a parameter of the punishment intensity if the corruption is detected.

By taking the first-order conditions with respect to $q$ and $\bar{p}$, we have

$$U_q = (\lambda - \frac{k}{\alpha^2}B)[\alpha(MR - \bar{p})] + (1 - \lambda)(\bar{p} - c) = 0 \tag{2.1}$$

and

$$U_{\bar{p}} = (\lambda - \frac{k}{\alpha^2}B)(-\alpha q) + (1 - \lambda)q = 0 \tag{2.2}$$

Solving the equations, we have

$$MR - MC = 0$$

That is to say, the optimal land supply in the corrupt deal equals the monopoly quantity just as though there were no corruption.

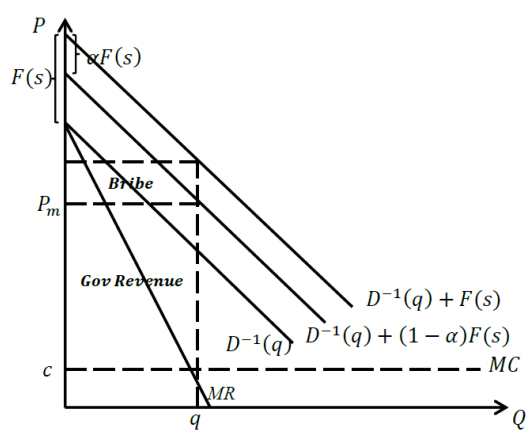
In this type of corruption, money is moved from the public fiscal account to the pockets of the bureaucrat and the developer. It is nothing more than a redistribution of the total benefits. Therefore, the corrupt bureaucrat is looking for a quantity that produces the largest amount for partitioning, which is the monopoly quantity. The costs of collecting the bribe come from two aspects: the loss in the net fiscal revenue and the increasing risk of being punished. Nonetheless, these costs can be internalized by the optimal agreed price $(\bar{p})$. When the anti-corruption campaign started, $k$ increased because the punishment was harsher and the supervision was stricter. The equation (2.2) results in a smaller $B$, which means that

the bureaucrat must shrink the size of the bribe. He/she can do this by raising the agreed price in the deal. There is no need to adjust the land quantity, since that would reduce the total amount to be partitioned. In summary, a reduction in the transaction volume of the residential land is not generally expected if we merely eliminate the corruption in the transaction stage.

## Type II Corruption without Theft (Corruption beyond Transactions)

In the second type of corruption, a bureaucrat provides buyers with extra services. There are two major differences in this and the previous type of corruption. First, it affects the buyers' willingness to pay, since the newly-provided services help the buyers to lower their costs in land development. When a buyer anticipates that he/she can get more from the land in the future, he/she might pay more for it. Therefore, the corruption works like a subsidy that shifts up the buyer's demand curve. Second, the bureaucrat does not need to appoint a specific buyer to make the corrupt deal. Whoever gets the land will face challenges such as with red tape, administrative approval, and demolition problems. As long as the land parcel is sold, the corrupt bureaucrat can always ask for bribes from the winner of the auction.

Denote $F(s)$ as the subsidy-effect when the bureaucrat provides $s$ units of extra services. Assume that the effect is marginally diminishing ($F'(s) > 0$, $F''(s) < 0$). As illustrated in Panel B, this shifts the demand curve up to $D^{-1}(q) + F(s)$. $F(s)q$ represents the total benefits generated by these services. Again, assume that the corrupt bureaucrat will take a fixed proportion ($\alpha$) as his/her personal gain. The demand curve will then move down by $\alpha F(s)$ for deducting the bureaucrat's share from the subsidy-effect. Notice that every buyer holds the expectation of both the future services and the bribes. Therefore, to beat the others and win the auction, one must bid the price at least at $P_m = D^{-1}(q) + (1-\alpha)F(s)$. The block between this specific winning price and the marginal cost is the net fiscal revenue received by the local government ($G$).




**Panel B**

Still, let $k$ be the parameter of the punishment intensity, then the problem for a corrupt bureaucrat is in choosing the optimal quantity ($q$) and services ($s$) to maximize his/her utility:

$$\max_{q,\, s} \qquad \lambda B + (1-\lambda)G - \frac{k}{2}L^2 - H(s)$$

where $H(s)$ is the cost of providing services with $H'(s) > 0$ and $H''(s) > 0$. Since there is no explicit loss for the government, the punishment is enforced based on the amount of the bribe ($B$), instead of the reimbursement loss ($L$).

The first-order partial derivatives with respect to $q$ and $s$ are:

$$U_q = (\lambda - kB)[\alpha F(s)] + (1-\lambda)[MR + (1-\alpha)F(s) - c] = 0 \tag{2.3}$$

and

$$U_s = (\lambda - kB)(\alpha q)F'(s) + (1-\lambda)(1-\alpha)qF'(s) - H'(s) = 0 \tag{2.4}$$

Solving the equations, we have:

$$MR - MC = -\frac{H'(s)}{F'(s)}\frac{F(s)}{(1-\lambda)q} \mid_{q=q^*,\, s=s^*} < 0$$

where $q^*$ and $s^*$ are the optimal land quantity and extra services. With corruption but no theft, the optimal land quantity is less than the monopoly level without corruption. Moreover, we can prove (see proof in Appendix C):

$$\frac{dq}{dk} \mid_{q=q^*} < 0$$

Therefore, the land supply will decrease if the optimal punishment becomes harsher. Since it is intuitive that offering the services is not without cost, the bureaucrat would provide more land than at the monopoly level because he/she needs to make up his/her cost in providing these services. When the punishment risk gets higher, maintaining the original bribe size becomes less profitable. As a fixed share of the total subsidy-effect, any decrease in bribe will reduce the level of service provided. When services are reduced, there will be no need to provide as much land as before.

In contrast to the previous model, the land supply is locked at the monopoly level and irrelevant to the punishment intensity $k$. The reason for this is that adjusting the agreed price ($\bar{p}$) in the transaction deal is free for the bureaucrat. Compared to assisting a developer in circumventing the red tape or coordinating the demolition, the bureaucrat inputs very little to adjust the agreed price in a corrupt transaction deal. The key issue here is that, in the second situation, the bureaucrat creates the opportunity of corruption by him/herself; in comparison, he/she directly steals the money from the government in the first situation.

### Predictions on Residential Land Sales after the Anti-corruption Campaign

We can provide our predictions on the possible influence of the anti-corruption campaign in accordance with the above models. In reality, the corruption in China exists both with and without theft. Therefore, in general, the overall land sales for residential use should be reduced after the campaign starts. Likewise, if a city has removed bureaucrats for the second type of corruption (i.e., corruption without theft that occurs beyond the transaction stage), we should observe a larger drop in the residential land sales in that city. However, if a city has removed bureaucrats only for the first type of corruption (i.e., corruption with theft occurring in the transaction stage), there should not be a significant change in the land sales.

## 2.4 Data

### Data of Land Sales in the Primary Market

Our data regarding residential land sales were collected from www.landchina.com. In 2004, the local land bureaus of China started to upload each land transaction onto this website.[10] The data record comprises numerous details, including the date of the contract, the information regarding the sellers and buyers, the land size (area), the remising fees (price), the use restrictions, the remising method, the stipulated plot ratio, the tenure of lease, etc. In this paper, we selected the data with the dates of contract between January 1, 2010 and December 31, 2016.[11]

One problem we encountered is that we were unable to identify errors in inputting the key information, such as the land size. In practice, we deleted the observations regarding which land sizes were unreasonable (land size ¿ 100 hectares or land size ¡ 0.1 hectares). As double insurance, we calculated the land unit price (i.e., remising fees/land size), deleting the data that had extreme values, and retaining the remaining in the 1% - 99% interval. In addition, we also excluded land allocations for public projects (e.g., public rental housing, low-rent housing, and affordable housing). That left us with 181,045 land transactions of private projects. The mean area was 3.26 hectares. For later use, we calculated the total

[10] The Ministry of Land and Resources, "Guan yu jian li tu di shi chang dong tai jian ce de tong zhi," 2004, http://www.mlr.gov.cn/zwgk/flfg/tdglflfg/200406/t20040625_584195.htm

[11] The database contains very early transaction records. Although the notice of the MLR was released in 2004, some of the records are traced to the years before that. We checked this part of the data and highly doubted the integrity of the data. Moreover, between 2004 and 2009, a very large number of the records do not have "electronic supervision numbers." The number is the only identifier for the individual transaction cases and it is used to prove that the specific case has been put on the MLR record. We have no idea why so many cases are missing the number. One possibility is that these cases were not input instantly when the transactions occurred. Out of an abundance of caution, we excluded the data from this period.

land area transacted by each city in each quarter between 2010 and 2016. The statistics are shown in Table 12.

## Data of Corruption

In November 2012, Xi Jinping initiated a wide-reaching anti-corruption campaign in China. After Xi assumed office in the 18th National Congress, the Party's Central Discipline Inspection Commission (CDIC) started to post the most influential cases on its official website.[12] By September 2015, more than 1000 names had been added to the CDIC's list, at the rate of almost one per day.

During the campaign, the central government set up an organization called the Leading Group for Inspection Work. This group subsequently accredited inspection teams (*xunshizu*) to the provinces, ministries, and state-owned enterprises. These teams assumed the responsibility of receiving tip-offs, conducting preliminary probes, and reporting useful information back to the CDIC. In the two years after the anti-corruption campaign began, four batches of inspection teams were sent to the provinces. In May 2013, the first batch was dispatched to five provinces. In November of the same year, another six teams were dispatched. Then, in March and July of 2014, two more batches were sent to the rest of provinces.[13] In this paper, we used the time that the inspection team was dispatched to a province as the dividing line for defining whether a prefectural city in the province was affected by the anti-corruption campaign or not.

To ascertain the details of the corruption in land sales, we collected a dataset of all of the cases posted by the CDIC between November 2012 and September 2015. For each investigated bureaucrat, we searched all of the reports, news, and legal documents[14] regarding his or her downfall. By reading the materials, we then determined whether this bureaucrat was involved in the corruption related to land sales. A city is labeled as "corrupt" if any bureaucrat that worked in the city before the anti-corruption campaign has been announced in an investigation.

Table 13 summarizes the corruption revealed by the anti-corruption campaign in the prefectural cities. Of the 308 cities,[15] two-thirds (218 cities) had fallen bureaucrats inspected by the CDIC and 95 had corrupt bureaucrats involved in land issues.[16] We distinguished between the two different corruption types: corruption in land transactions and corruption

[12]http://www.ccdi.gov.cn/jlsc/.

[13]The first batch (May 2013) inspected the provinces of Hubei, Chongqing, Jiangxi, Guizhou, and Neimenggu. The second batch (November 2013) inspected Jilin, Yunnan, Shanxi, Anhui, Guangdong, and Hunan. The third batch (March 2014) inspected Gansu, Beijing, Shandong, Ningxia, Tianjin, Xinjiang, Hainan, Henan, Fujian, and Liaoning. The last batch (July 2014) inspected Guangxi, Shanghai, Qinghai, Xizang, Zhejiang, Hebei, Shaaxi, Heilongjiang, Sichuan, and Jiangsu.

[14]Legal documents include CDIC inspection reports, indictments, and verdicts, if available.

[15]The provinces of Beijing, Shanghai, Tianjin, and Chongqing (directly controlled municipalities) and those of Xinjiang, Qinghai, and Xizang (Tibet) are not included.

[16]One drawback is that we do not know the exact use of the land involved with corruption. For those corruption cases in which land uses can be identified, residential land accounts for an absolute proportion.

beyond transactions. Corrupt bureaucrats in 51 cities took a hand during the transaction stage, lowering the real land prices and causing losses to the local fiscal revenue. Bureaucrats in 76 cities were investigated for abusing their power to help developers in acquiring extra benefits in other stages of land development.

## 2.5 Empirical Results

### Model Specification

China's anti-corruption campaign is analogous to a natural experiment that allowed us to establish the variations in corruption. The dispatch of inspection teams created an exogenous shock in prefectural cities. After the inspections, the corruption intensity decreased and the costs of continuing corruption increased. In addition, the inspections revealed the type of corruption in land sales leading up to the anti-corruption campaign. As our model predicts, removing different types of corruption changes land sales in different ways. To empirically test how the anti-corruption campaign has affected land sales, we consider the following difference-in-differences (DID) model:

$$Y_{iq} = \beta_0 + \beta_1 D_i + \beta_2 T_{iq} + \beta_3 (D_i \cdot T_{iq}) + \beta_4 \mu_q + \epsilon_{iq}$$

where $Y_{iq}$ is the total area of residential land (for private projects) sold by prefectural city $i$ in quarter $q$. $T_{iq}$ is a dummy variable that is equal to 1 if an inspection team has been dispatched to the city's province no later than quarter $q$. $D_i$ is another dummy variable that is equal to 1 if the CDIC has reported any bureaucrat of city $i$ who is corrupt on land issues. The definition of $D_i$ may be adjusted in different situations later in this paper. For example, when we focus on the effects of corruption without theft, $D_i$ is set to be 1 if city $i$ is confirmed to show only the second type of land corruption. For disambiguation, we state the definition of $D_i$ before we run the model. Finally, $\mu_q$ is a set of quarter dummy variables, and $\epsilon_{iq}$ is the error term.

For clarification, in this paper, we focus on the change in corruption intensity, and not the absolute magnitude of corruption.$D_i = 1$ means that for city $i$, the campaign did remove certain corrupt bureaucrats or remove some specific forms of corruption (e.g., corruption with or without theft). However, this does not necessarily imply that city i must be more corrupt than other cities before the anti-corruption campaign.

Except for the change in corruption intensity, another cause of decreased land supply is administrative omission. It is a byproduct of the anti-corruption campaign. Even if a local bureaucrat is honest and upright, he/she may fear any negligence of work that may be exploited by political rivals. As a result, bureaucrats have increasingly avoided their normal duties.[17] This paper uses the DID model to exclude the effect of administrative

[17]http://cn.reuters.com/article/china-anticorruption-reform-official-war-idCNKBS0EE0S220140603, June 2014, Routers China.

omission. Our goal is to identify the relative change between different prefectural cities, that is, to know how much more conservative land supply is in cities where corruption has been removed relative to cities where no corruption is found.

## Overall Effect of Removing Corruption

First, we do not differentiate the types of corruption and examine the overall effect of the anti-corruption campaign. Figure 5 shows a plot of the average area of residential land (for private projects) sold by prefectural cities in chronological order. On the left-hand side, quarters are indicated along the horizontal axis. The red vertical line marks the fourth quarter of 2012, when President Xi Jinping assumed office. The CCP's 18th National Congress was held in that November, and the anti-corruption campaign was officially initiated. The diagram shows that the effect of the campaign might not have been immediate, as land sales did not decrease when the campaign started, but they did decrease after five quarters. We then reset the time axis by calculating the number of quarters since the inspection team was sent to a city's province. The new scatter diagram is shown on the right-hand side. The decrease in land sales is now much closer to the new time marker. Thus, for local bureaucrats, the inspection team poses a real threat. This is why we adopt the arrival of inspection teams to define the time dummy variable in the DID model.

Table 14 lists the regression results obtained by running the DID model. In the first two columns, $D_i$ equals 1 if city $i$ is found to have any corrupt bureaucrat who worked in the city before the anti-corruption campaign. In columns 3 and 4, $D_i$ equals 1 if city $i$ had any bureaucrat who is involved in land corruption.[18] The CDIC removed corruption in cities reported to have corrupt bureaucrats ($D_i = 1$), resulting in a larger shock in local corruption intensity. For the interaction term, all estimates in Table 14 are significantly negative. It means that removing corruption (related to land issues) makes residential land sales more conservative. To check the robustness, we add the city fixed-effect and the quarter fixed-effect to the model. We find that the estimates are robust enough.

## Effects of Removing Different Types of Corruption

According to our theoretical model, removing corruption occurring at the land transaction stage (first type) should not make a big difference in land sales, whereas removing corruption beyond the transaction stage (second type) will decrease the land supply at the monopoly level. Table 14 shows that, overall, the anti-corruption campaign led to a decrease in residential land sales. However, it did not differentiate the impact of different types of corruption.

To determine the difference between types of corruption, we divided prefectural cities into groups based on the inspection results of the anti-corruption campaign: without reported corruption (88 cities), with reported corruption but irrelevant to land issues (121 cities),

[18]The numbers of cities in each group is slightly different from that in Table 13 because there are five cities whose land sales data are missing.

with only the first type of land corruption being reported (19 cities), with only the second type of land corruption being reported (44 cities), and with both types of land corruption (31 cities). Figure 6 shows residential land sales for each group. It should be noted that for all groups, the land area sold after the arrival of inspection teams is lower than the area sold before. It confirms the existence of administrative omission. Even if no corrupt bureaucrat is caught in the crackdown in the anti-corruption campaign, land sales still become more conservative than before.

Figure 6 shows that the residential land sales in cities with the second type of land corruption are more volatile, especially in the period before the inspection teams arrived. In contrast, cities with only the first type of land corruption have a very similar dynamic pattern in land sales to those without any bureaucrats who are caught. These preliminary findings are consistent with what our model suggests: removing corruption beyond the transaction stage is the major reason for the decrease in residential land sales.

We then empirically test the above findings via regressions. Columns 1 and 2 in Table 15 compare the residential land sales between cities with no corruption and cities with only the first type of land corruption (Panels 1 and 4). The interaction terms are not significant. Thus, removing corruption in the transaction stage does not affect land sales. Columns 3 and 4 compare the land sales between cities with only the second type of land corruption cities with no corruption (Panels 1 and 3). The interaction term is significantly negative. Therefore, removing corruption in stages beyond the transaction does decrease land sales.

In addition, we perform more tests by controlling the first type of land corruption. We compare cities that have corruption that is irrelevant to land issues with cities that have corruption related to land issues but only of the second type (i.e., land corruption occurring beyond the transaction stage.) The difference in land sales between those two groups indicates the effect of removing the second type of corruption when the first type is missing (i.e., no corruption in land transactions is detected.) Figure 6 compares land sales in Panels 2 with Panel 3. The estimation results are listed in the first two columns of Table 16. They show that removing the second type of land corruption does lead to a greater decrease in residential land sales. Similarly, we compare Panels 4 and 5 to see how land sales differ in cities with the first type of land corruption. The estimation results are listed in the last two columns of Table 16. the estimations confirm that removing the second type of corruption causes a larger decrease in residential land sales.

The above estimation results are consistent with our predictions from the theoretical model. Overall, the anti-corruption campaign decreases the supply of residential land, and only corruption beyond the transaction stage (i.e., second type) is of importance. Removing this type of corruption eliminates services that can help a real estate developer in circumventing red tape. Owing to the higher risk of being inspected, local bureaucrats are unwilling to provide such services any more. Because they do not provide these services, there is no need to make up their costs of providing the services by supplying land, resulting in a decrease in land supply. On the other hand, simply removing corruption in the transaction stage (i.e., first type) does not make too much difference in land sales. This type of corruption is no more than a redistribution of current benefits. It does not create new welfare, and therefore,

removing it has very little influence on land supply.

### Residential Land Supplied for Public Projects

Both Figures 5 and 6 show a downward trend in residential land supply for private projects. One important question is whether we can observe a similar pattern in the land supplied for public residential projects (e.g., public rental housing, low-rent housing, and affordable housing). If local governments increase the land supply for other projects, the total quantity of residential land provided might also increase, even if we observe a decrease in the land used for private projects. Moreover, if this strategy is purposely adopted by the local governments, it is questionable whether removing corruption leads to a welfare loss owing to the increase in total land supply.

Figure 7 shows a plot of the residential land supplied on average for public projects in prefectural cities. The upward trend was reversed since the CDIC inspection teams were dispatched. Most land for public projects is delivered through administrative allocation. The remising fee is very limited, and the entire process of land development is under heavy supervision. Compared to selling land for private projects, there is not too much room for rent-seeking in this type of land use. A probable explanation for the reversal in pattern remains administrative omission. Local bureaucrats avoid doing things in which they might make mistakes. It also implies the necessity of applying the DID model.

In other words, after the anti-corruption campaign began, there was no substitutional relation between the land provided for public and private projects. The total supply of residential land is indeed lowered when corruption is removed from the monopoly market. Thus, our findings do support the "greasing-the-wheels" hypothesis, that is, corruption could be beneficial to the economy with other preexisting distortions.

## 2.6 Discussions and Conclusions

Local bureaucrats in China are very clever. They have many ways of disguising corruption in land markets. Many things differ from what is shown. For example, remising fees could be returned, and therefore, the transaction price is not the real price. Auctions could be manipulated, and therefore, the bidders are actually actors. In a transaction contract, only the stipulated land size is credible and unchangeable. Unlike other studies that focused on the prices or remising methods, this paper discusses corruption in China's land market in the context of land quantity.

When an economy has a low outcome owing to some preexisting distortions, corruption could be a positive factor in that it offers a "second-best world." Conversely, removing beneficial corruption will lower the outcome, making it deviate from the socially desired level. Our basic findings support the "greasing-the-wheels" hypothesis. We show that removing corruption from China's monopoly land market causes a decrease in the land transaction volume. Furthermore, not removing any form of corruption also leads to this decrease. Only

corruption that can help real estate developers circumvent red tape and reduce trading costs is of importance.

We contribute to current literatures by providing microlevel evidence for the "greasing-the-wheels" hypothesis. We are able to establish that an exogenous variation occurs in the local corruption intensity owing to the anti-corruption campaign. Along with the predistorted environment of China's land market, we restate the anecdotal stories with the model, data, and estimations, and we show how corruption can correct an economic inefficiency and how an inappropriate anti-corruption campaign may worsen the situation.

Since 2013, China has experienced another round of increases in the real estate prices. The sky-high prices coincided with a decrease in residential land supply. We believe that this phenomenon can be partly explained by the ongoing anti-corruption campaign. Obviously, this campaign is well-intentioned and has positive effects. However, without eliminating institutional defects (e.g., unreasonable approval procedures, red tape, monopoly in land supply, etc.), merely removing corruption from the system may negatively affect the market and worsen the situation.

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Table 1: Comparison of the Central Cluster and the Periphery

| | Obs. | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| **Central Group** | | | | | |
| Connection Degree | 157 | 2.204 | 2.7 | 1 | 22 |
| PageRank | 157 | 0.002 | 0.004 | 0.0007 | 0.045 |
| **Periphery** | | | | | |
| Connection Degree | 900 | 0.278 | 0.642 | 0 | 7 |
| PageRank | 900 | 0.001 | 0.0004 | 0.0007 | 0.0079 |

Notes: This table compares the central group with the periphery group in Figure 1. As shown, the average degree of connection between officials on the periphery is only one-tenth of the central group's and their highest pagerank is only one-sixth of the central group's. Thus, we can infer that the big tigers should be located in the central cluster.

Table 2: Summary Statistics of Provincial Leaders

| | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Probe (1=Yes; 0=No) | 354 | 0.155 | 0.363 | 0 | 1 |
| Being reported to be a subordinate of any big tiger (1=Yes; 0=No) | 354 | 0.079 | 0.27 | 0 | 1 |
| Factional indictors (1=Yes; 0=No) | | | | | |
| Connected with any of the big tigers | | | | | |
| Being born in the same province (*tongxiang*) | 354 | 0.062 | 0.242 | 0 | 1 |
| Having graduated from the same university (*tongxue*) | 354 | 0.119 | 0.324 | 0 | 1 |
| Having overlapping work experience (*tongshi*) | 354 | 0.24 | 0.428 | 0 | 1 |
| Connected with either Xi Jinping or Wang Qishan | | | | | |
| Being born in the same province (*tongxiang*) | 354 | 0.04 | 0.195 | 0 | 1 |
| Having graduated from the same university (*tongxue*) | 354 | 0.093 | 0.291 | 0 | 1 |
| Having overlapping work experience (*tongshi*) | 354 | 0.093 | 0.291 | 0 | 1 |
| Connected with any of other Central PSC members | | | | | |
| Being born in the same province (*tongxiang*) | 354 | 0.034 | 0.181 | 0 | 1 |
| Having graduated from the same university (*tongxue*) | 354 | 0.24 | 0.428 | 0 | 1 |
| Having overlapping work experience (*tongshi*) | 354 | 0.257 | 0.438 | 0 | 1 |
| Age | 354 | 55.393 | 4.276 | 44 | 66 |
| Gender (1=Male; 0=Female) | 354 | 0.921 | 0.271 | 0 | 1 |
| Administrative Rank (1= Leading roles in provinces; 0= Assisting roles) | 354 | 0.22 | 0.415 | 0 | 1 |

Notes: This table shows the summary statistics of probes, factional ties, and demographics of 354 provincial leaders. The sample includes the probed provincial officials and the 2012 list of provincial Politburo Standing Committee members (PPSC). For Zhou, the overlapping work experience includes any of the following cases: the Ministry of Petroleum Industry and PetroChina (1985-1998), the Ministry of Land and Resource (1998-1999), Sichuan province (1999-2002), the Central Politics and Laws Committee (2002-2012). For Ling Jihua, the overlapping work experience includes any of the following cases: the Central Committee of the Communist Youth League (1985-1995), General Office of the Central Committee (1995-2012). For Su Rong, the overlapping work experience includes any of the following cases: Qinghai province (2001-2003), Gansu province (2003-2006), Jiangxi province (2007-2012).

Table 3: Estimations of a Single-Equation Probit Model: Factional Indicators and the Investigation Odds for Provincial Leaders

| | Dependent Variable: Probe (1=Yes; 0=No) | |
|---|---|---|
| | Attitudes of Xi Jinping and Wang Qishan | Attitudes of other PSC members |
| | Connected to the big tigers | Connected to the big tigers |
| Being born in the same province (*tongxiang*) | 1.549*** | 1.435*** |
| | (0.432) | (0.378) |
| Having graduated from the same university (*tongxue*) | -0.522 | -0.799 |
| | (0.949) | (0.937) |
| Having worked in the same governmental unit (*tongshi*) | 0.802*** | 0.762** |
| | (0.305) | (0.301) |
| | Connected to Xi and Wang | Connected to other PSC members |
| Being born in the same province (*tongxiang*) | -0.170 | 0.264 |
| | (0.326) | (0.466) |
| Having graduated from the same university (*tongxue*) | -1.048 | -1.146 |
| | (1.058) | (1.013) |
| Having worked in the same governmental unit (*tongshi*) | -0.472 | -0.859 |
| | (0.497) | (0.534) |
| Other Control Variables | YES | YES |
| Number of observations | 354 | 354 |
| Log pseudo-likelihood | -129.725 | -129.263 |

Notes: This table shows the parameter estimates of the single-equation probit model. The sample includes the probed provincial officials and the 2012 list of provincial Politburo Standing Committee members (PPSC). Being connected with the big tigers does increase the possibility of being probed. No evidence shows that incumbent Party leaders are protecting their own followers. Robust standard errors in parentheses, clustered at the prefectural level. ***p<0.01, **p<0.05, *p<0.1.

Table 4: Estimations of the Recursive Selection Model: Factional Indicators and the Investigation Odds for Provincial Leaders

| | Attitudes of Xi Jinping and Wang Qishan | Attitudes of other PSC members |
|---|---|---|
| Equation (1): $\beta_1$ | Connected to the big tigers | Connected to the big tigers |
| Being born in the same province (*tongxiang*) | 0.807** | 0.972*** |
| | (0.391) | (0.338) |
| Having graduated from the same university (*tongxue*) | -1.010 | -0.778 |
| | (0.680) | (0.656) |
| Having worked in the same governmental unit (*tongshi*) | 1.597** | 1.553** |
| | (0.675) | (0.784) |
| Equation (2): $\beta_2$ | Connected to Xi and Wang | Connected to other PSC members |
| Being born in the same province (*tongxiang*) | 0.339 | -0.0135 |
| | (0.227) | (0.113) |
| Having graduated from the same university (*tongxue*) | -0.306 | -0.333 |
| | (0.366) | (0.360) |
| Having worked in the same governmental unit (*tongshi*) | -0.202 | -0.141 |
| | (0.176) | (0.186) |
| Overall intensity of purge: $\gamma$ | 0.271** | 0.301** |
| | (0.119) | (0.145) |
| Other Control Variables | Yes | Yes |
| Constant | Yes | Yes |
| rho | -0.932* | -0.914* |
| Number of observations | 354 | 354 |
| Log pseudo-likelihood | -152.786 | -154.21055 |

Notes: This table shows the FIML estimates of the recursive selection model. Positive $\gamma$ proves the existence of a political purge. No evidence shows that incumbent Party leaders are protecting their own followers. Robust standard errors in parentheses, clustered at the prefectural level. ***p<0.01, **p<0.05, *p<0.1.

Table 5: Big Tigers and Their Kingdoms

| | System/Unit | Positions | No. of Probes of the System |
|---|---|---|---|
| Zhou, Yongkang | PetroChina; 1988-1998 | Deputy manager/Manager | 11 |
| | Sichuan; 1999-2002 | Party secretary | 56 |
| Ling, Jihua | Shanxi | (Birthplace) | 53 |
| | The Central General Office; 1995-2012 | Director | 0 |
| Su, Rong | Qinghai; 2001-2003 | Party secretary | 9 |
| | Gansu; 2004-2006 | Party secretary | 14 |
| | Jiangxi, 2007-2012 | Party secretary | 32 |

Notes: This table lists the units that the three big tigers took charge of prior to the anti-corruption campaign. For each unit, we report the number of probed officials who once worked there. As shown, the provinces of Sichuan, Shanxi, and Jiangxi top the number of probes.

Table 6A: Summary Statistics of Prefectural-Level Leaders (2006-2012, Position-Based)

| | Group I Sichuan, Shanxi and Jiangxi | | Group II Other Provinces | | P-value |
|---|---|---|---|---|---|
| Variables | Mean | Std. Dev. | Mean | Std. Dev. | |
| Age (age at the end of term) | 52.86 | 3.527 | 52.24 | 4.22 | 0.205 |
| Tenure (term length in months) | 36.33 | 15.89 | 36.27 | 16.01 | 0.974 |
| Gender (1=Male; 0=Female) | 0.857 | 0.352 | 0.948 | 0.221 | 0.002 |
| Positions (1=Prefectural Party Secretary; 0=City Mayor) | 0.476 | 0.502 | 0.439 | 0.497 | 0.526 |
| Promotion (1=Yes; 0=No) | 0.464 | 0.502 | 0.566 | 0.496 | 0.086 |
| Relative GDP growth rates | 0.131 | 1.041 | -0.025 | 1.442 | 0.343 |
| Having worked for (1=Yes; 0=No) | | | | | |
| The provincial General Office | 0.131 | 0.339 | 0.153 | 0.36 | 0.608 |
| Other provincial units | 0.429 | 0.498 | 0.368 | 0.483 | 0.291 |
| The Youth League at provincial level or above | 0.119 | 0.326 | 0.12 | 0.326 | 0.972 |
| Local corruption intensity | 1.988 | 1.904 | 1.91 | 2.914 | 0.812 |
| Local corruption intensity (city leaders excluded) | 1.833 | 1.741 | 1.806 | 2.893 | 0.934 |
| Connections to any PPSC member (1=Yes; 0=No) | | | | | |
| Being born in the same province (*tongxue*) | 0.345 | 0.478 | 0.271 | 0.445 | 0.165 |
| Having graduated from the same university (*tongxiang*) | 0.333 | 0.474 | 0.258 | 0.438 | 0.153 |
| Having overlapping work experience (*tongshi*) | 0.631 | 0.485 | 0.505 | 0.501 | 0.034 |
| Number of Observations | 84 | | 465 | | |

Notes: This table shows the summary statistics of demographics, career experience, factional ties and local economic growth for prefectural-level (city) leaders. Beijing, Shanghai, Tianjin, Chongqing (the directly-controlled municipalities) and Xizang (Tibet) are not included. The sample contains only the city leaders who served full terms between 2006 and 2012. Different positions of the same officials are treated as separate observations. The p-value from the two-sample t test is listed in the last column.

Table 6B: Summary Statistics of Prefectural-level City Leaders (2006-2012, Individual-Based)

| | Group I Sichuan, Shanxi and Jiangxi | | Group II Other Provinces | | P-value |
|---|---|---|---|---|---|
| Variables | Mean | Std. Dev. | Mean | Std. Dev. | |
| Age (age at the end of a term) | 52.771 | 3.502 | 52.187 | 4.266 | 0.278 |
| Tenure (term length, in months) | 36.371 | 16.5 | 37.293 | 16.01 | 0.657 |
| Gender (1=Male; 0=Female) | 0.871 | 0.337 | 0.95 | 0.219 | 0.012 |
| Positions (1=Party Secretary; 0=City Mayor) | 0.443 | 0.5 | 0.399 | 0.49 | 0.497 |
| Probe (1=Yes; 0=No) | 0.157 | 0.367 | 0.106 | 0.308 | 0.21 |
| Relative GDP Growth Rates | 0.148 | 0.988 | -0.023 | 1.457 | 0.345 |
| Having worked for the provincial G.O. (1=Yes; 0=No) | 0.143 | 0.352 | 0.144 | 0.352 | 0.976 |
| Local Corruption Intensity (city leaders are excluded) | 1.743 | 1.742 | 1.815 | 2.992 | 0.845 |
| Number of Observations | 70 | | 416 | | |

Notes: This table shows the summary statistics of demographics, career experience, factional ties and local economic growth for prefectural-level (city) leaders. Beijing, Shanghai, Tianjin, Chongqing (the directly-controlled municipalities) and Xizang (Tibet) are not included. The sample contains only the city leaders who served full terms between 2006 and 2012. For the officials who served for more than one positions, only the first position is counted. The p-value from the two-sample t test is listed in the last column. Aba (zhou) is excluded for the Sichuan earthquake in 2008.

Table 7: Promotion for Prefectural-City Leaders: Relative GDP Performance

| | Dependent Variable: Promotion (1=Yes; 0=No) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | Group I | Group II | All Provinces | | 5th-95th Percentiles in Relative GDP | | Most and Least Corrupt Provinces | |
| Relative GDP Growth Rate | -0.058 | 0.029** | 0.023 | 0.028* | 0.037 | 0.031 | 0.067** | 0.068** |
| | (0.049) | (0.014) | (0.015) | (0.015) | (0.032) | (0.031) | (0.031) | (0.028) |
| Group I * Relative GDP Growth Rate | | | -0.086 | -0.069 | -0.149** | -0.090 | -0.131** | -0.111* |
| | | | (0.055) | (0.053) | (0.066) | (0.066) | (0.061) | (0.058) |
| Age | 0.456 | 0.116 | | 0.127 | | 0.156 | | 0.103 |
| | (0.481) | (0.097) | | (0.101) | | (0.101) | | (0.165) |
| Age*Age | -0.005 | -0.002 | | -0.002* | | -0.002* | | -0.001 |
| | (0.005) | (0.001) | | (0.001) | | (0.001) | | (0.002) |
| Tenure (in months) | 0.008** | 0.001 | | 0.001 | | 0.001 | | 0.002 |
| | (0.004) | (0.001) | | (0.001) | | (0.001) | | (0.002) |
| Positions | -0.119 | -0.025 | | -0.038 | | -0.048 | | -0.056 |
| (1=Party Secretary; 0=City Mayor) | (0.122) | (0.047) | | (0.043) | | (0.046) | | (0.054) |
| Gender | 0.284* | -0.138 | | -0.014 | | -0.014 | | 0.028 |
| (1=Male; 0=Female) | (0.159) | (0.103) | | (0.092) | | (0.106) | | (0.117) |
| Provincial Capital City | -0.207 | 0.265** | | 0.236** | | 0.227** | | 0.139 |
| (1=Yes; 0=No) | (0.232) | (0.105) | | (0.099) | | (0.103) | | (0.125) |
| Observations | 83 | 465 | 548 | 548 | 492 | 492 | 322 | 322 |
| R-squared | 0.195 | 0.201 | 0.071 | 0.183 | 0.082 | 0.188 | 0.118 | 0.227 |
| Provincial FE | YES | YES | YES | YES | YES | YES | YES | YES |

Notes: This table shows the parameter estimates of the OLS model. The sample used in columns 5 and 6 do not contain the outliers in relative GDP growth rate. Columns 7 and 8 compare the provinces in Group I with the provinces the have no more than two leaders being probed. Aba (zhou) is excluded for the Sichuan earthquake in 2008. This table shows that the correlation between promotion and relative GDP performance was much weaker in provinces controlled by the big tigers (Group I). Robust standard errors in parentheses, clustered at the prefectural level. ***p<0.01, **p<0.05, *p<0.1.

Table 8: Promotion for Prefectural-City Leaders: Work Experience in Provincial Units and the Youth League

| | Dependent Variable: Promotion (1=Yes; 0=No) | | | | | | |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| | Group I | Group II | Group I | Group II | Group I | Group II | All Provinces |
| Provincial General Office | -0.242** | 0.188*** | | | | | 0.212*** |
| | (0.091) | (0.056) | | | | | (0.058) |
| Provincial CYL | | | 0.067 | 0.028 | | | 0.084 |
| | | | (0.177) | (0.060) | | | (0.068) |
| Other Provincial Departments | | | | | -0.028 | 0.042 | 0.087* |
| | | | | | (0.113) | (0.046) | (0.048) |
| Group I * Provincial General Office | | | | | | | -0.549*** |
| | | | | | | | (0.145) |
| Group I * Provincial CYL | | | | | | | -0.408** |
| | | | | | | | (0.168) |
| Group I * Other Prov. Depts | | | | | | | -0.231 |
| | | | | | | | (0.144) |
| Other Control Variables | YES | YES | YES | YES | YES | YES | YES |
| Observations | 84 | 465 | 84 | 465 | 84 | 465 | 549 |
| R-squared | 0.205 | 0.211 | 0.181 | 0.194 | 0.181 | 0.195 | 0.206 |
| Provincial FE | YES | YES | YES | YES | YES | YES | YES |

Notes: This table shows the parameter estimates of the OLS model. Before the anti-corruption campaign, work experience in provincial units and the Youth League was less helpful in terms of the prefectural-level leaders in Group I getting promoted. Robust standard errors in parentheses, clustered at the prefectural level. ***p<0.01, **p<0.05, *p<0.1.

Table 9: Promotion for Prefectural-City Leaders: Factional Ties with the Provincial Leaders

| | Dependent Variable: Promotion (1=Yes; 0=No) | | |
|---|---|---|---|
| | Group I | Group II | All Provinces |
| Connections to PPSC Members | | | |
| Having graduated from same institution (*tongxue*) | 0.170 | -0.031 | -0.031 |
| | (0.126) | (0.050) | (0.050) |
| Having been born in same city (*tongxiang*) | 0.145 | -0.024 | -0.026 |
| | (0.095) | (0.055) | (0.055) |
| Having overlapping work experience (*tongshi*) | 0.041 | 0.072 | 0.071 |
| | (0.134) | (0.045) | (0.045) |
| Group I * *tongxue* | | | 0.095 |
| | | | (0.125) |
| Group I * *tongxiang* | | | 0.145 |
| | | | (0.108) |
| Group I * *tongshi* | | | -0.156 |
| | | | (0.121) |
| Other Control Variables | YES | YES | YES |
| Observations | 84 | 465 | 549 |
| R-squared | 0.214 | 0.200 | 0.185 |
| Provincial FE | YES | YES | YES |

Notes: This table shows the parameter estimates of the OLS model. Before the anti-corruption campaign, the factional indicators didn't help promotion for prefectural-level leaders. There is no significant difference between the two groups of provinces. Robust standard errors in parentheses, clustered at the prefectural level. ***p<0.01, **p<0.05, *p<0.1.

Table 10: Promotion for Prefectural-City Leaders: Local Corruption Intensity

| | Dependent Variable: Promotion (1=Yes; 0=No) | | | | | |
|---|---|---|---|---|---|---|
| | (1) Group I | (2) Group II | (3) All Provinces | (4) Group I | (5) Group II | (6) All Provinces |
| Local Corruption Intensity (Number of probes) | 0.062*** | 0.007 | 0.007 | | | |
| | (0.021) | (0.014) | (0.014) | | | |
| Group I * Local Corruption Intensity | | | 0.047* | | | |
| | | | (0.025) | | | |
| Local Corruption Intensity (City leaders excluded) | | | | 0.066*** | 0.006 | 0.006 |
| | | | | (0.023) | (0.014) | (0.014) |
| Group I * Local Corruption Intensity (City leaders excluded) | | | | | | 0.048** |
| | | | | | | (0.024) |
| Other Control Variables | YES | YES | YES | YES | YES | YES |
| Observations | 84 | 465 | 549 | 84 | 465 | 549 |
| R-squared | 0.223 | 0.195 | 0.184 | 0.222 | 0.195 | 0.183 |
| Provincial FE | YES | YES | YES | YES | YES | YES |

Notes: This table shows the parameter estimates of the OLS model. Before the anti-corruption campaign, only in the provinces controlled by the big tigers (Group I) was the number of probes in a city positively correlated with the promotion odds of a city leader. Robust standard errors in parentheses, clustered at the prefectural level. ***p<0.01, **p<0.05, *p<0.1.

Table 11: Possibility of Being Probed and Non-Meritocratic Promotions

| | Dependent Variable: Probe (1=Yes; 0=No) | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Promotion* Non-meritocratic type | 0.077* | 0.082* | 0.122* | 0.128** |
| | (0.044) | (0.043) | (0.062) | (0.062) |
| Promotion (1=Yes; 0=No) | | | -0.020 | -0.016 |
| | | | (0.036) | (0.035) |
| Non-meritocratic type (1=Yes; 0=No) | | | -0.044 | -0.047 |
| | | | (0.044) | (0.044) |
| Age | | -0.001 | | -0.001 |
| | | (0.004) | | (0.004) |
| Gender (1=Male; 0=Female) | | 0.097** | | 0.095** |
| | | (0.039) | | (0.039) |
| Tenure (in months) | | 0.002** | | 0.002** |
| | | (0.001) | | (0.001) |
| Positions (1=Prefectural Party Secretary; 0=City Mayor) | | -0.002 | | 0.001 |
| | | (0.031) | | (0.031) |
| Capital City of a Province (1=Yes; 0=No) | | 0.070 | | 0.072 |
| | | (0.061) | | (0.061) |
| Observations | 486 | 486 | 486 | 486 |
| R-squared | 0.056 | 0.076 | 0.058 | 0.079 |
| Provincial FE | YES | YES | YES | YES |

Notes: This table shows the parameter estimates of the OLS model. If a city leader was "unexpectedly" promoted before the anti-corruption campaign, he was more likely to be charged for corruption during the campaign. Robust standard errors in parentheses, clustered at the prefectural level. ***p<0.01, **p<0.05, *p<0.1.

Table 12: Area of Transacted Land for Residential Use (Private Projects) 2010 - 2016

| Land Size (in hectares) | Obs | Mean | Std. Dev | Min | Max |
|---|---|---|---|---|---|
| Transactions | 181,045 | 3.258 | 3.832 | 0.1 | 99 |
| City*Quarter | 8,484 | 62.864 | 78.532 | 0 | 1502.19 |

Notes: This table shows the size of the land sold for private real estate projects between 2010 and 2016. In addition to providing the statistics regarding all of the transaction cases, we calculated the area sold by each city (303 cities) in each quarter (28 quarters).

Table 13: Corruption of Prefectural Cities

| Having Corruption on Land Issues | | | | Having Corruption on Other Issues | No Corruption Reported |
|---|---|---|---|---|---|
| Type I (51 cities) | | Type II (76 cities) | | | |
| Over-reimbursing remising fees | 21 | Approving use-rights certificates | 15 | | |
| Over-reimbursing demolition fees | 6 | Approving development project plans | 30 | | |
| Manipulating auctions | 23 | Approving adjustment of plot ratio | 10 | | |
| Causing huge losses in land sales (unspecified) | 26 | Helping in coordinating demolition | 27 | | |
| 95 cities | | | | 123 cities | 90 cities |

Notes: This table shows the results reported by the CDIC inspection teams in its first-round nation-wide inspection tour (up to November 2015). The provinces of Beijing, Shanghai, Tianjin, Chongqing (the directly-controlled municipalities), and Xinjiang, Qinghai, and Xizang (Tibet) are not included. The total number of prefectural cities is 308.

Table 14: Residential Land Sales and Removing Corruption

| | Land Area Sold for Residential Use (for Private Projects) | | | |
|---|---|---|---|---|
| VARIABLES | (1) | (2) | (3) | (4) |
| T | -2.193 | 9.780*** | -7.098* | 4.107 |
| | (4.206) | (3.308) | (3.696) | (3.068) |
| Corruption | 23.83*** | | | |
| | (2.447) | | | |
| T*Corruption | -13.38*** | -11.73*** | | |
| | (3.3) | (2.27) | | |
| Land Corruption | | | 22.44*** | |
| | | | (2.84) | |
| T*Land Corruption | | | -10.57*** | -9.430*** |
| | | | (3.53) | (2.706) |
| Constant | YES | YES | YES | YES |
| City FE | NO | YES | NO | YES |
| Quarter FE | YES | YES | YES | YES |
| R-squared | 0.061 | 0.545 | 0.061 | 0.544 |
| Observations | 8484 | 8484 | 8484 | 8484 |

Notes: This table shows the parameter estimates of the DID model. In Columns 1 and 2, $D_i$ equals 1 if city $i$ is found to have any corrupt bureaucrat who worked in the city before the anti-corruption campaign. In Columns 3 and 4, $D_i$ equals 1 if city $i$ had any bureaucrat who is involved in land corruption. This table shows that removing corruption (related to land issues) makes residential land sales more conservative. Robust standard errors are indicated in parentheses. ***p<0.01, **p<0.05, *p<0.1.

Table 15: Residential Land Sales and Different Types of Land Corruption

| | Land Area Sold for Residential Use (for Private Projects) | | | |
|---|---|---|---|---|
| | Panel 1 vs. Panel 4 | | Panel 1 vs. Panel 3 | |
| VARIABLES | (1) | (2) | (3) | (4) |
| T | -3.747 | -0.814 | 6.956 | 12.21** |
| | (5.011) | (3.902) | (6.399) | (5.191) |
| Land Corruption I | -10.44*** | | | |
| | (3.236) | | | |
| T*Land Corruption I | 3.817 | 3.676 | | |
| | (4.433) | (3.133) | | |
| Land Corruption II | | | 36.60*** | |
| | | | (3.883) | |
| T*Land Corruption II | | | -18.90*** | -18.58*** |
| | | | (5.099) | (3.724) |
| Constant | YES | YES | YES | YES |
| City FE | NO | YES | NO | YES |
| Quarter FE | YES | YES | YES | YES |
| R-squared | 0.033 | 0.615 | 0.081 | 0.591 |
| Observations | 2996 | 2996 | 3696 | 3696 |

Notes: This table compares cities having only the first/second type of land corruption with cities having no corruption. These estimations show that removing the second type of land corruption leads to a larger decrease in land sales; this effect disappears upon removing the first type of land corruption. Robust standard errors are indicated in parentheses. ***p<0.01, **p<0.05, *p<0.1.

Table 16: Residential Sales and Second Type of Land Corruption

| | Land Area Sold for Residential Use (for Private Projects) | | | |
|---|---|---|---|---|
| | Panel 2 vs. Panel 3 | | Panel 4 vs. Panel 5 | |
| VARIABLES | (1) | (2) | (3) | (4) |
| T | -10.58** | 3.614 | 1.218 | 14.48* |
| | (5.357) | (4.375) | (9.1) | (8.493) |
| Land Corruption II | 19.38*** | | 61.03*** | |
| | (3.834) | | (6.154) | |
| T*Land Corruption II | -7.737 | -9.025** | -26.37*** | -23.64*** |
| | (4.927) | (3.699) | (7.384) | (6.093) |
| Constant | YES | YES | YES | YES |
| City FE | NO | YES | NO | YES |
| Quarter FE | YES | YES | YES | YES |
| R-squared | 0.075 | 0.548 | 0.131 | 0.455 |
| Observations | 4620 | 4620 | 1400 | 1400 |

Notes: This table tests the effect of removing the second type of land corruption when we control the first type. In the first two columns, the sample used includes all cities that are corrupt but do not show the first type of land corruption. In the last two columns, the sample used includes all cities that are involved in the first type of land corruption. Again, the estimations confirm that removing the second type of corruption causes a larger decrease in residential land sales. Robust standard errors are indicated in parentheses. ***p<0.01, **p<0.05, *p<0.1.

Table A1: Response Rates on the Five-Point Score Questions

| Questions: To what degree is/are [OPTION] an obstacle to the current operations of this establishment? | 0= No Obstacle | 1= Minor Obstacle | 2=Minor Obstacle | 3=Major Obstacle | 4=Major Obstacle | No response |
|---|---|---|---|---|---|---|
| Tax Administration | 51.78% | 28.00% | 16.41% | 2.78% | 0.59% | 0.44% |
| Business Licensing and Permits | 72.04% | 22.44% | 3.85% | 0.85% | 0.33% | 0.48% |
| Courts | 74.96% | 19.93% | 2.78% | 0.22% | 0.11% | 2.00% |
| Corruption | 73.70% | 19.89% | 3.56% | 0.70% | 0.26% | 1.89% |
| Number of Observations | | | | 2700 | | |

Source: The World Bank's Global Enterprise Surveys.

Table A2: Summary Statistics of the Five-Point Scores and the Number of Probes

| | Obs (No. of cities) | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Options | | | | | |
| Tax Administration | 23 | 0.731 | 0.6 | 0.141 | 2.148 |
| Business Licensing and Permits | 23 | 0.343 | 0.319 | 0.013 | 1.426 |
| Court System | 23 | 0.27 | 0.153 | 0.054 | 0.679 |
| Corruption | 23 | 0.307 | 0.176 | 0.106 | 0.774 |
| Number of probes | 23 | 5.652 | 6.471 | 0 | 26 |

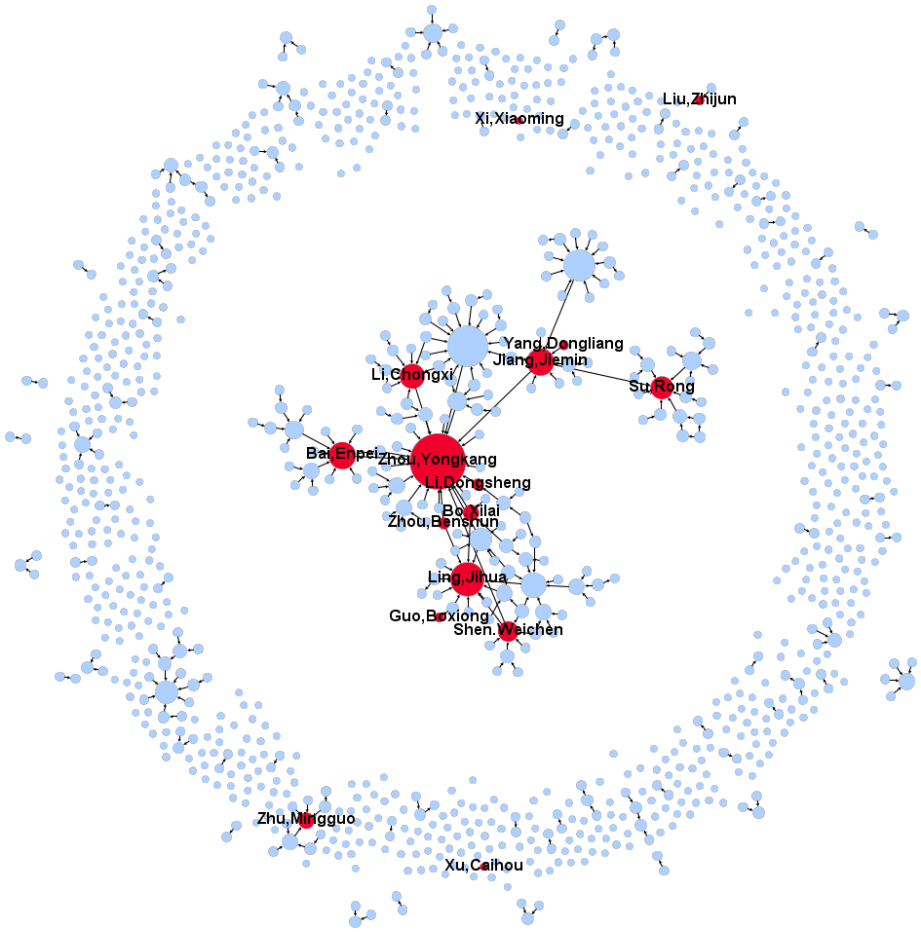
Source: The World Bank's Global Enterprise Surveys.

Table A3: Correlations between the Five-Point Scores and the Number of Probes

| | Tax | Business Licensing and Permits | Courts | Corruption | Tax | Business Licensing and Permits | Courts | Corruption |
|---|---|---|---|---|---|---|---|---|
| Dependent Variable: Average score of responses | | | | | | | | |
| Number of probes (in deciles) | 0.091** | 0.072*** | 0.0363*** | 0.029*** | 0.065 | 0.065** | 0.038** | 0.032** |
| | (0.026) | (0.012) | (0.006) | (0.005) | (0.074) | (0.025) | (0.013) | (0.011) |
| Observations | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 |
| R-squared | 0.208 | 0.389 | 0.225 | 0.434 | 0.307 | 0.443 | 0.348 | 0.534 |
| Provincial FE | NO | NO | NO | NO | YES | YES | YES | YES |
| Dependent Variable: Average score of responses (in deciles) | | | | | | | | |
| Number of probes (in deciles) | 0.557** | 0.741*** | 0.763*** | 0.444** | 0.429 | 0.662** | 0.795*** | 0.431** |
| | (0.184) | (0.164) | (0.076) | (0.146) | (0.414) | (0.264) | (0.200) | (0.172) |
| Observations | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 |
| R-squared | 0.287 | 0.458 | 0.545 | 0.206 | 0.418 | 0.607 | 0.595 | 0.300 |
| Provincial FE | NO | NO | NO | NO | YES | YES | YES | YES |
| Dependent Variable: Average score of responses | | | | | | | | |
| Number of probes | 0.042* | 0.044** | 0.016* | 0.021** | 0.021 | 0.055** | 0.019 | 0.029** |
| | (0.022) | (0.014) | (0.008) | (0.006) | (0.047) | (0.018) | (0.018) | (0.012) |
| Observations | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| R-squared | 0.125 | 0.341 | 0.176 | 0.323 | 0.281 | 0.586 | 0.404 | 0.543 |
| Provincial FE | NO | NO | NO | NO | YES | YES | YES | YES |

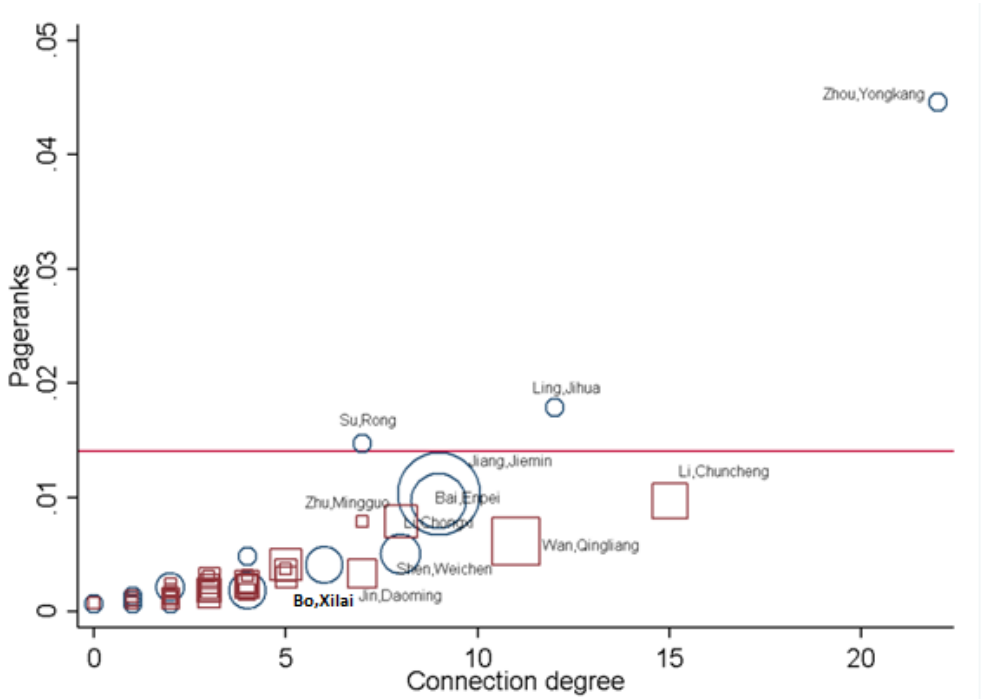
Notes: This table shows the parameter estimates of the OLS model. We tried three alternative specifications to reduce the impact of the outlier. In each specification, the number of probes is found to be positively correlated with firms' perceptions of corruption. Robust standard errors in parentheses, clustered at the prefectural level. ***p<0.01, **p<0.05, *p<0.1.

Figure 1: A Probed Network of Reported Political Connections



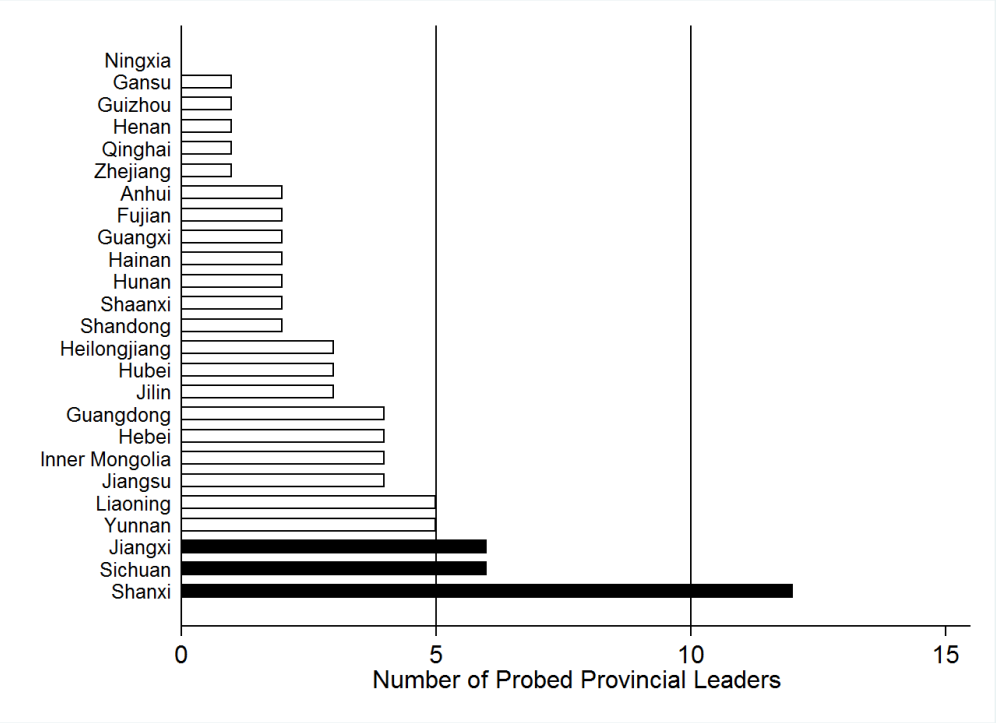

Source: The Central Discipline Inspection Commission (updated to September 2015). Notes: Each node represents a probed official. A line connecting two dots represents a reported political connection. The attached arrows point from clients to patrons. The size of each node is determined by the number of lines connected to it. To distinguish officials, we colored red the ones ranked equal to or above the "leading roles of ministries and provinces"(*zheng shengbuji*.

Figure 2: Network Centralities of Senior Probed Officials



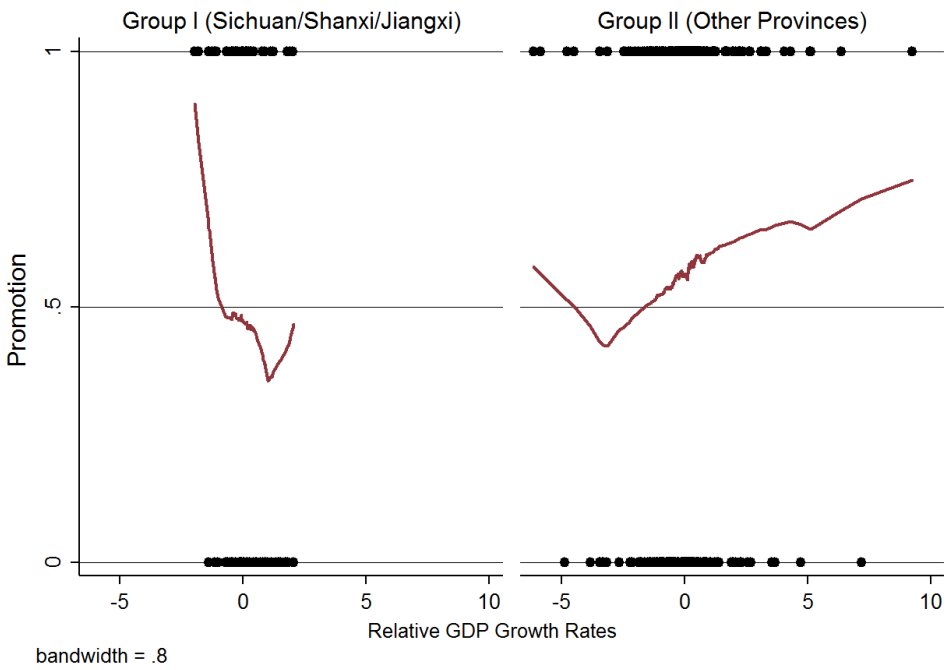

Source: The Central Discipline Inspection Commission (updated to September 2015). Notes: This figure labels the connection degree and the pagerank for all the senior probed officials in the network diagram. Hollow circles highlight the senior officials with the administrative ranks of "leading roles of ministries and provinces" (*zheng shengbuji*). The size of each symbol is weighted by the betweenness centrality. Three Party leaders are identified as the big tigers targeted by the central government Zhou Yongkang, Ling Jihua and Su Rong. Being higher in the connection degrees implies that they are more interconnected with other probes. Topping the pagerank means that many of their followers have been also investigated. The smallest betweenness centralities of the three means that Zhou, Ling and Su are unlikely to be an agent of someone else.

Figure 3: Number of Probes at the Provincial Level



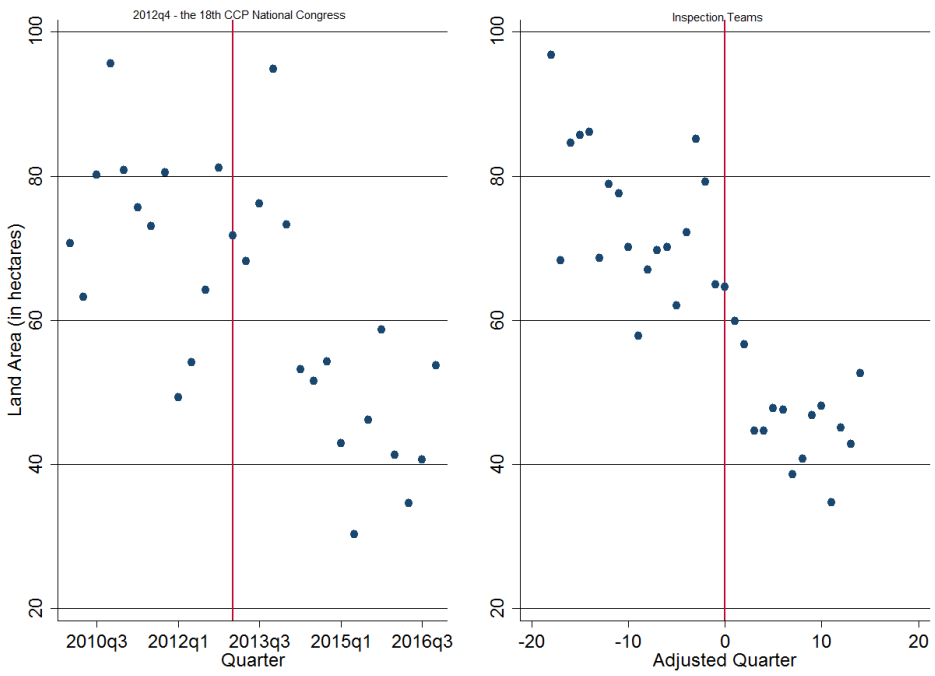

Source: The Central Discipline Inspection Commission (updated to September 2015). Notes: This figure arranges the provinces in the number of probed provincial leaders. Jiangxi, Sichuan, and Jilin, the three provinces controlled by the big tigers, have more probes than other provinces.

Figure 4: Lowess Smoother - Promotion and Relative GDP Growth Rates



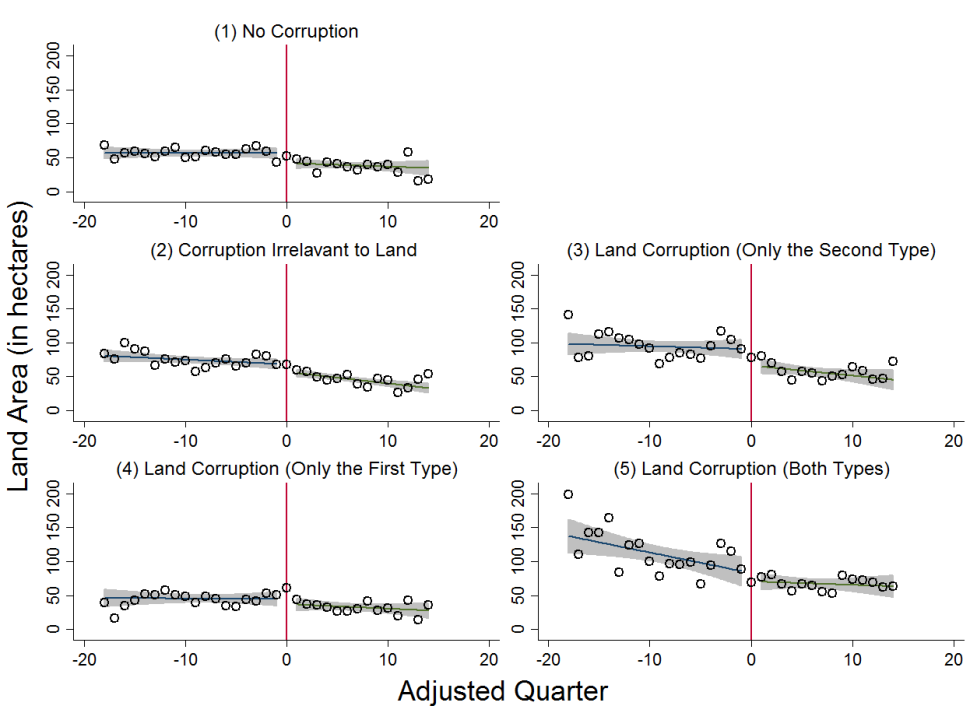

Notes: This figure illustrates the Lowess Smoother for the two groups of provinces. Bandwidth is 0.8. Before the anti-corruption campaign, in the three provinces controlled by the big tigers (Group I), the possibility of promotion and relative GDP performance presented a negative correlation. By contrast, other provinces (Group II) adhered to meritocracy in which higher GDP growth rates led to higher promotion odds.

Figure 5: Decrease in Residential Land Sales (for Private Projects)



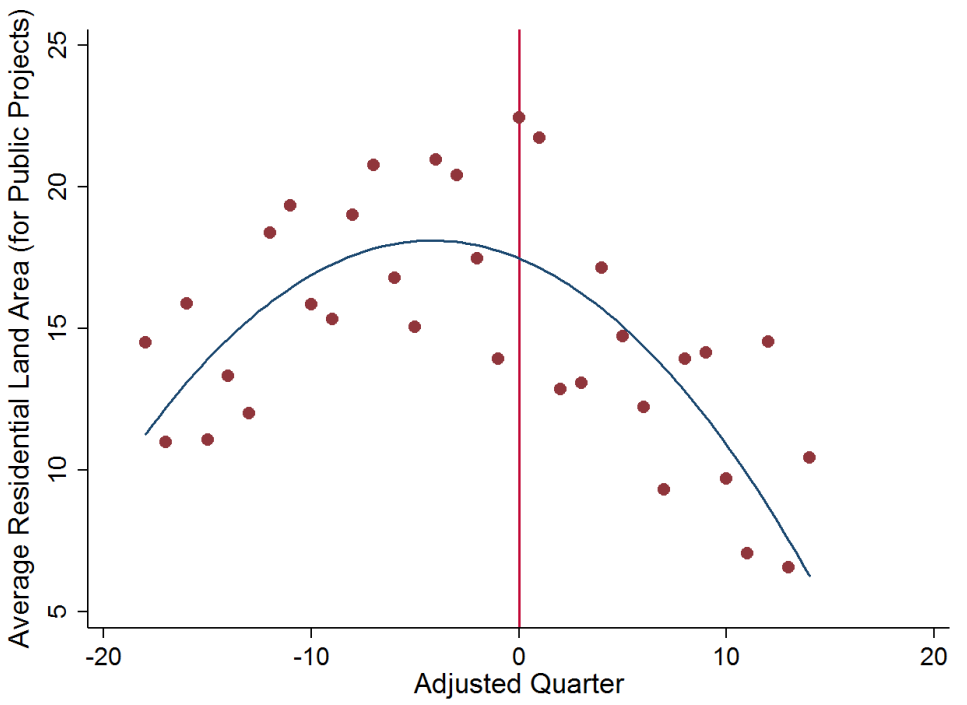

Notes: This figure shows how residential land sales (for private projects) are affected by the CDIC inspection teams. The vertical axis indicates the average area of residential land (for private projects) sold by prefectural cities. The horizontal axis in the left-hand-side diagram indicates quarters. The horizontal axis in the right-hand-side diagram indicates adjusted quarters since the arrival of the inspection teams.

Figure 6: Residential Land Sales (for Private Projects) by Corruption Types



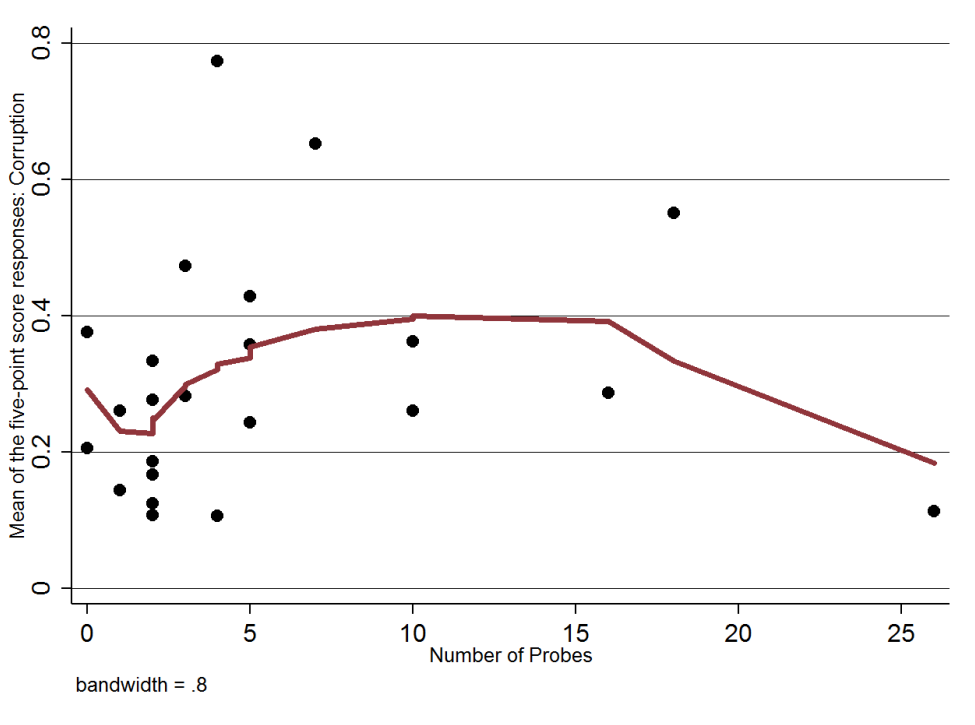

Notes: This figure divides prefectural cities into groups based on the types of corruption seen in them. The vertical axis indicates average land sales for residential use. The horizontal axis indicates quarters since the arrival of the inspection teams. The 95% confidence interval is shown. This figure shows that removing the second type of land corruption is the major cause of the decrease in land sales.

Figure 7: Residential Land Supply for Public Projects




Notes: This figure shows the land area (in hectares) supplied for public residential projects on average in prefectural cities. It clearly shows a reversal pattern since the dispatch of the inspection teams.

Figure A1: Lowess smoother - Firms' Perceptions of Corruption and the Number of Probes




Source: The World Bank's Global Enterprise Surveys.
Notes: This figure illustrates the Lowess Smoother between the number of probes for each city and the average score of firms' perceptions of corruption. Bandwidth is 0.8. The positive correlation is reversed by the last dot at the right end.

# Appendix A

# Identification of the Recursive Selection Model

The model is given by

$$y_{1i}^* = \beta_1 x_{1i} + \epsilon_{1i} \tag{A.1}$$

$$y_{2i}^* = \beta_2 x_{2i} + \gamma y_{1i}^* + \epsilon_{2i} \tag{A.2}$$

$$y_{2i} = \mathbf{1}(y_{2i}^* > 0) \tag{A.3}$$

$$y_{1i} = \mathbf{1}(y_{1i}^* > 0)\mathbf{1}(y_{2i}^* > 0) \tag{A.4}$$

$$\epsilon_{1i} \sim N(0,1), \epsilon_{2i} \sim N(0,1), cor(\epsilon_{1i}, \epsilon_{2i}) = \rho \tag{A.5}$$

As the Heckman selection model, or a standard bi-probit model without recursion, the equation of selection (A.2) can be estimated independently as long as the error term is uncorrelated to regressors. To disprove this in our model, plug (A.1) into (A.2), then we have

$$y_{2i}^* = \gamma\beta_1 x_{1i} + \beta_2 x_{2i} + \gamma\epsilon_{1i} + \epsilon_{2i} \tag{A.6}$$

or equivalently,

$$\frac{y_{2i}^*}{\sqrt{1+\gamma^2+2\rho\gamma}} = \frac{\gamma\beta_1}{\sqrt{1+\gamma^2+2\rho\gamma}} x_{1i} + \frac{\beta_2}{\sqrt{1+\gamma^2+2\rho\gamma}} x_{2i} + v_{2i} \tag{A.7}$$

where $v_{2i} \sim N(0,1)$. It is obvious that, even if there were no selection bias and $\rho = 0$, estimation of $X_{2i}$ is biased for the recursive coefficient $\gamma$.

Define $v_{1i} \equiv \epsilon_{1i} \sim N(0,1)$, $v_{2i} \equiv \frac{\gamma\epsilon_{1i}+\epsilon_{2i}}{\sqrt{1+\gamma^2+2\rho\gamma}} \sim N(0,1)$. The model is equivalent to

$$y_{1i}^* = \beta_1 x_{1i} + \epsilon_{1i} \tag{A.8}$$

$$\frac{y_{2i}^*}{\sqrt{1+\gamma^2+2\rho\gamma}} = \frac{\gamma\beta_1}{\sqrt{1+\gamma^2+2\rho\gamma}} x_{1i} + \frac{\beta_2}{\sqrt{1+\gamma^2+2\rho\gamma}} x_{2i} + v_{2i} \tag{A.9}$$

$$y_{2i} = \mathbf{1}(y_{2i}^* > 0) \tag{A.10}$$

$$y_{1i} = \mathbf{1}(y_{1i}^* > 0)\mathbf{1}(y_{2i}^* > 0) \tag{A.11}$$

$$v_{1i} \sim N(0,1), v_{2i} \sim N(0,1), cor(v_{1i}, v_{2i}) = \frac{\rho+\gamma}{\sqrt{1+\gamma^2+2\rho\gamma}} \tag{A.12}$$

- It turns out to be a standard bi-probit selection model.
- $\beta_1$, $\frac{\gamma\beta_1}{\sqrt{1+\gamma^2+2\rho\gamma}}$, $\frac{\beta_2}{\sqrt{1+\gamma^2+2\rho\gamma}}$ and $\frac{\rho+\gamma}{\sqrt{1+\gamma^2+2\rho\gamma}}$ can be identified.
- From the first two items, $\frac{\gamma}{\sqrt{1+\gamma^2+2\rho\gamma}}$ can be identified.
- $\gamma$ and $\beta$ are identified. More specially, let $A \equiv \frac{\gamma}{\sqrt{1+\gamma^2+2\rho\gamma}}$, $B \equiv \frac{\rho}{\sqrt{1+\gamma^2+2\rho\gamma}}$, a simple calculation brings us $\rho = \frac{B}{\sqrt{1-2AB-A^2}}$, $\gamma = \frac{A}{\sqrt{1-2AB-A^2}}$.
- Since $\gamma$ and $\beta$ are identified, $\beta_2$ is also identified.

# Appendix B

# The World Bank's Enterprise Surveys vs. Local Corruption Intensity

Between December 2011 and February 2013, the World Bank interviewed 2,700 privately owned firms in China as a part of its Global Enterprise Surveys. The survey covered 23 prefectural cities,[1] containing over 100 indicators to benchmark the quality of the business environment. The indicators in Section J of the survey measured how corrupt businessgovernment relations hinder firms' operations. The World Bank first set up a series of frequent scenarios between private firms and local governments. Firms were asked to describe the real experience if they faced these situations. At the end of the questionnaire, firms were asked their overall perceptions of the government's behavior by answering a set of five-point scale questions:

*"To what degree is/are [OPTION] an obstacle to the current operations of this establishment?"*

We selected four from the six options provided by the survey (J30a - H30). Three of them develop specific scenarios, asking firms about how the operation is affected by the tax administration and the process of applying for business permits, as well as to what extent they are affected by the local court system. The last one we picked measures firms' overall perceptions of local corruption.[2] The distribution of firms' responses for each option is listed in Table A1. The response rate for each question is not less than 98%.

For each question, we averaged the five-point scores over firms in the same city. We show the consistency between the average scores and the "local corruption intensity" (number of probes) proposed in our paper. We expect a strongly positive correlation (i.e., the number of probes reflecting firms' perceptions of establishment operations). In other words, the "local corruption intensity" is a good measurement of the local political environment.

The summary statistics of all 23 prefectural cities are shown in Table A2. However, when compared with the smooth distribution in firms' responses, the number of probes

[1] To match our main data in the article, two municipalities (Beijing and Shanghai) were excluded.

[2] The two not selected are "tax rates" and "political instability."

varies across the cities. Since the World Bank's data only covers 23 cities, the outliers may greatly influence the correlation in which we are interested. For example, Figure A1 plots the number of probes against the average score of firms' perceptions of corruption. The positive correlation is reversed by the last dot at the right end.

To resolve this problem, we adopted three alternative strategies. The first is taking the deciles for the number of probes. The second is taking the deciles for both the number of probes and the average scores. Transforming the actual data into deciles can efficiently shorten the distance between the outlier and the other observations. In addition, we also ran the regressions after dropping the outlier from the sample.

OLS results are reported in Table A3. The dependent variable is the (deciles of) mean of each five-point scores. The independent variable is the (deciles of) number of probes for each city. The fixed effect at provincial level is considered. Robust standard errors are presented in the parentheses.

According to the results, the number of probes is found to be positively correlated with the firms' perceptions. For most of the five-point scale questions, the correlations are strongly significant. That is to say, if firms felt that the business-government relation was more corrupt and inefficient prior to the anti-corruption campaign; then in the campaign more corrupt officials would be caught. Therefore, the number of successful probes is a good proxy for local corruption severity.

# Appendix C

# Removing Corruption Type II: A Decrease in Land Sales

Proof: The maximization problem is

$$\max_{q,\, s} \qquad \lambda B + (1-\lambda)G - \frac{k}{2}L^2 - H(s)$$

The first-order conditions are

$$U_q = (\lambda - kB)[\alpha F(s)] + (1-\lambda)[MR + (1-\alpha)F(s) - c] = 0$$

$$U_s = (\lambda - kB)(\alpha q)F'(s) + (1-\lambda)(1-\alpha)qF'(s) - H'(s) = 0$$

Taking the derivative with respect to k gives

$$U_{qq}\frac{dq}{dk} + U_{qs}\frac{ds}{dk} = \alpha^2 F^2 q$$

$$U_{qs}\frac{dq}{dk} + U_{ss}\frac{ds}{dk} = \alpha^2 F F' q$$

Then

$$\frac{dq}{dk} \mid_{q=q^*} = \frac{\alpha^2 F q}{U_{qq}U_{ss} - U_{qs}U_{qs}}(U_{ss}F - U_{qs}F'q) \mid_{q=q^*,\, s=s^*}$$

Because $U_s = 0$, $F' > 0$, $F'' < 0$, $H' > 0$ and $H'' > 0$, we obtain

$$U_{ss}F - U_{qs}F'q = \frac{H'}{F'}(FF'' - F'F') - H''F < 0$$

The Hessian matrix is negative definite to guarantee that $U$ reaches a local maximum. That is, $U_{qq}U_{ss} - U_{qs}U_{qs} > 0$. Finally,

$$\frac{dq}{dk} \mid_{q=q^*} < 0$$

□