TURNING A BLIND EYE? ON THE POLITICAL ECONOMY OF ENVIRONMENTAL REGULATION IN CHINA

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ABSTRACT. This paper provides a political economy interpretation of environmental data manipulation in China using a unique panel dataset that combines city-level air pollution, economic indicators as well as resumé-type characteristics of local officials. We quantify the magnitude of data manipulation for each city/year using a novel censored MLE strategy and then link city-level manipulation behavior with party secretary and mayor characteristics using LASSO shrinkage. We find that having elite-educated party secretaries is associated with increased manipulation of air quality data at the city level. The results are consistent with economic growth and promotion concerns providing potential explanations for our findings.

JEL codes: C24, C50, Q52, Q53, Q56

1. Introduction

China has long utilized regular performance evaluation and promotion incentives to induce its local officials to comply with centrally mandated economic, social, and environmental targets. Environmental regulation is often compromised however, as government officials face competing targets. The worst-case scenario is when environmental compliance is achieved not by reducing emissions but by falsifying the data. Issues with the accuracy of Chinese air pollution data were first noted in Andrews (2008a,b) and have been examined by various econometric techniques in Chen et al. (2012), Ghanem and Zhang (2014) and Fu et al. (2014). In particular, Ghanem and Zhang (2014) found evidence consistent with manipulation for about half of the reporting cities during 2001-2010. However, all of the previous studies focus on the statistical significance of manipulation, i.e. examining whether there is data manipulation, rather than its economic significance. In this paper, we focus on providing a political economy interpretation of data falsification behavior in China, which is based on a new econometric method of quantifying data manipulation. The empirical analysis is based on a unique data set that combines reported air quality information with resumé details of city party secretaries and mayors.

First of all, we propose a new econometric method to estimate the degree of data manipulation in the presence of a policy threshold. During 2001-2010, the Chinese central government used the number of blue-sky days, which are days with air pollution index (API) less than 101, as one of the performance measures to evaluate local officials. In particular, the 10th and 11th Five-Year Plans (2001-2005 and 2006-2010) set specific targets for the proportion of blue-sky days in a year.[1] This naturally leads to an incentive to manipulate the API to be less than 101 as long as the manipulation is hard to detect by the public. Using a data set of daily air quality for 111 cities between 2001 and 2010, we estimate the annual proportion of data manipulation around the blue-sky day cutoff via censored maximum likelihood estimation (MLE). Our proposed method is new to the literature of data manipulation and excess bunching (Chetty et al., 2011; Ito and Sallee, 2017) as we explain below. We find

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[1]Source: `http://www.gov.cn/zhengce/content/2008-03/28/content_4877.htm` (in Chinese). Retrieved on March 8, 2018.

that the mean proportion of manipulation among blue-sky days is about 3.1% and the mean number of manipulated blue-sky days is about 8.5 in a year. The proportion of manipulation among blue-sky days is small by construction, since we only measure manipulation that under-reports PM_{10} concentrations that are "close" but above the blue-sky day cut-off.

Second, we explain the heterogeneous manipulation behavior by linking it to local officials' characteristics. We compile a new panel dataset with detailed demographic, education, and work experience information of party secretaries and mayors in charge of those 111 cities between 2001 and 2010. We combine the panel with censored MLE estimates on manipulation behavior to examine the relationship between data falsification and local officials' background characteristics. Given the large amount of information contained in the new panel, we use a machine learning method, the least absolute shrinkage and selection operator (LASSO) proposed in Belloni et al. (2014b). In this data-abundant era, machine learning methods are increasingly important in economics (Belloni et al., 2014a; Mullainathan and Spiess, 2017; Athey, 2018). The LASSO was previously used to check for omitted variable bias (Chen, 2015) or to construct instruments (Mueller-Smith, 2015; Chen and Yeh, 2017). In this paper, we use it to find the key predictors of city-level manipulation among party secretary and mayor characteristics. We also illustrate how to check the robustness of its results and to perform subsequent analysis to interpret them.[2]

The most pronounced result we find is that having an elite-educated party secretary in power is a significant predictor of increased city-level manipulation. We specifically find that having such a secretary is associated with a statistically significant 1.1% increase in the proportion of manipulation among blue-sky days, which is about one-third of the mean proportion of manipulation among blue-sky days in our sample. Regarding manipulated blue-sky days, it is associated with an additional 2.38 such days in a year, also one-third of the mean number of manipulated blue-sky days in our sample. This result is robust to numerous checks.

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[2]It is important to note that these robustness checks do not have the same theoretical guarantees of valid post-selection inference as the baseline regressions, but they are done in order to show empirical researchers the sensitivity of our main result to certain aspects of our baseline LASSO regression.

Elite education can capture several unobservable characteristics, such as ability, signaling, and connectedness, which are hard to separate in our data. When examining the heterogeneity in manipulation behavior among elite educated party secretaries, we found that those with previous research experience or previous work experience as a county mayor are associated with significantly less manipulation behavior than others. Because research experience and work experience as county mayor are both ability proxies of local officials, the results suggest that it is unlikely that the unobservable characteristic channeled through the elite education variable in the context of manipulation is ability.

We find no evidence that the characteristics of mayors are significant predictors of city-level manipulation. It is widely believed that party secretaries are in charge of party affairs such as personnel, while mayors' responsibilities lie in the daily operation of the city government. This leads to the conjecture that mayors, especially given their administrative role, are responsible for environmental data collection and its quality. We argue that mayors' characteristics are not predictive of city-level data falsification behavior because they are not the most powerful city-level officials. A mayor is unlikely to engage in data manipulation without the implicit consent of the party secretary, which makes the characteristics of party secretaries rather than mayors significant predictors of data manipulation.

Our results further indicate that higher proportions of manipulation are positively correlated with economic growth within a city after controlling for general time trends when an elite educated party secretary is in power, whereas they are slightly negatively correlated under other party secretaries. On an annual basis, Chinese city leaders are evaluated according to a predetermined set of performance indicators including economic growth, social stability, and environmental targets. Economic growth is the ultimate target for local officials and is associated with higher pollution levels. Local officials are hence reluctant to protect the environment due to pressure to grow the economy. Our result is consistent with the conjecture that these city party secretaries prioritize economic growth at the cost of 'honestly' meeting the environmental targets.

Since Chinese local officials are motivated by their future promotion, we also examine the correlation between promotion and manipulation for elite-educated and other party secretaries. We find that promotion and manipulation are positively correlated for elite-educated party secretaries whereas they are negatively correlated for other party secretaries, even after controlling for city-specific unobservables that can affect the probability of promotion and manipulation. This correlation differential is largest for promotion to the position of chief manager of a provincial department and other province-level party and government positions.

Our research contributes to several strands of the literature. First, it suggests that meritocratic promotions might create unintended consequences in terms of data manipulation. Economists argue that the Chinese central government uses the incentive of career advancement to induce desirable economic and political outcomes for local officials (Li and Zhou, 2005; Xu, 2011). However, a growing body of literature raises the concern whether meritocratic promotions can select competent leaders (Ghanem and Zhang, 2014; Jia et al., 2015; Fisman and Wang, 2017). Our contribution to this literature is to provide evidence that some officials' characteristics that matter for promotion are also significant predictors of manipulation. In particular, because education level is an important determinant of promotion (Shih et al., 2012), those officials with elite-college status are more likely to manipulate data because their expected benefit of manipulation is greater.

Second, our research points to party secretaries' role in environmental protection. Previous literature has found that environmental performance is more predictive of mayors' promotion. For example, Zheng et al. (2013) find that GDP growth is the only significant predictor of the probability of promotion for party secretaries, whereas mayors' promotion is predicted by both economic growth and pollution reductions. Furthermore, Jia (2017) finds that pollution tends to increase during the tenure of mayors who are better connected to the Politburo Standing Committee, whereas the empirical evidence did not strongly support similar findings for party secretaries. Our finding that data manipulation is more likely

to occur under elite-college educated party secretaries does not contradict the previous literature, but adds an interesting layer to our understanding of the Chinese environmental regulatory system and the complexity that results from the dual-head structure of local leadership. It provides suggestive evidence that party secretaries prioritize economic targets and hence implicitly allow mayors to manipulate the data to meet the environmental targets.

Third, the econometric method we propose to estimate the proportion of data manipulation is general and can be applied in any setting where there is a policy cut-off that incentivizes manipulation. For example, the proposed method could be used to uncover the degree of test score manipulation in high-stakes testing in schools (Dee et al., 2011; Diamond and Persson, 2016; Figlio, 2006; Figlio and Getzler, 2002; Jacob, 2005; Reback and Cullen, 2006), or to estimate the proportion of "excess bunching," such as in the literature on behavioral responses to tax policy (Saez, 2010; Chetty et al., 2011). Our methodology could also be used to estimate the proportion of manipulation in the running variable in any regression discontinuity design. Compared to the polynomial fitting approach (Chetty et al., 2011), our censored MLE method uses a new identification strategy to recover the counterfactual or un-manipulated data distribution with arguably more realistic assumptions not only in our own setting of air quality data manipulation but also in other settings of data manipulation and excess bunching.

The paper is organized as follows. Sections 2 and 3 describe the institutional background and data, respectively. Section 4 outlines the identification strategy of the proportion of manipulation and presents the relevant estimation results. Section 5 presents the results on the relationship between local official characteristics and manipulation behavior. Section 6 concludes.

2. Institutional Background

China's local political system is intricate, not only because each city is ruled by a party secretary and a mayor, but also because the division of labor between them and their relative power is complex. One of the key determinants of a local official's position in the

political hierarchy is the administrative ranking of the city where he/she is posted. The four direct-controlled municipalities - including Beijing, Shanghai, Tianjin, and Chongqing - are province-level cities. They are followed by 15 sub-provincial cities, mostly provincial capitals. The vast majority of cities are at the prefecture level. There are also county-level cities, but they are not in our sample of analysis.[3] In order to understand a government official's ranking in the political system, we must take other political affiliations of the official into account, in addition to the administrative ranking of the city in question.

Although a city party secretary and a mayor are posted at the same administrative level, their political affiliations can be different. In most cases, the party secretary has superior political affiliations to the mayor in the same city. The party secretary of a direct-controlled municipality is usually a politburo member, which is at the sub-national level, while the mayor remains at the provincial level. For a provincial capital city or a city with economic importance, its party secretary is usually a standing member of the provincial party committee, which is at the sub-provincial level, while its mayor is still at the prefecture level. In these cases, the party secretaries strictly dominate the mayors in political ranking.

In most prefecture-level cities, party secretaries and mayors have the same administrative and political rank. However, it does not imply that they share power equally. Only in very rare cases, a mayor plays an equal or even dominant role in local politics. In general, however, since the party has unequivocal leadership in Chinese politics, the party secretary is the top leader of a city and has full control over the local government. The mayor is usually a deputy party secretary and hence reports to the latter. Furthermore, during 2001-2010, many party secretaries were also heading the local People's Congress, which is typically in charge of appointing the mayor of the city.

In addition, even though the Chinese political system has a built-in mechanism of mutual supervision, the local officials are all subordinates to the party secretary. The integrity of the party secretary relies mainly on self-supervision. Therefore, the party secretary has absolute local power in both party and government without an effective supervision and

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[3]Note that in China, counties are lower in administrative ranking than cities.

control mechanism. Furthermore, the party secretary determines the promotion of most local officials. He/she can also influence the appointment of new local officials. For instance, although the mayor is appointed by higher-level government officials, the recommendation of the party secretary is very important in the decision process. To summarize, although Chinese cities use the dual-head system for checks and balances to keep a leader from getting too powerful, the party secretary of a city is still unambiguously the dominant local leader.

It is important to understand the promotion of local officials in China, which is determined by a complex set of factors. The official guiding principles of promotion are best described in the Comprehensive Assessment and Evaluation Methods for Local Party and Government Leaders (2009 No. 13) published by the Organization Department of the Chinese Communist Party.[4] The document stipulates that the assessment is based on five categories: ideological and political construction, leadership, work performance, anti-corruption, and compliance with the key objectives and tasks. In terms of key performance indicators, local officials are assessed according to the following criteria: economic development, social development, and sustainable development. Environmental protection and emissions reduction is listed as a key indicator subject to annual assessment for both party secretaries and mayors.

3. DATA

We assemble a unique city-level panel dataset of 111 cities between 2001 and 2010, which includes party secretary and mayor characteristics, annual economic data, as well as annual measures of manipulation of blue-sky days, which is constructed using our daily air quality variables. A list of cities in our data set is given in Table A1.

3.1. **Party Secretary and Mayor Data.** We construct a detailed data set of demographic, education, and work experience variables for all party secretaries and mayors that held office in the 111 cities between 2001-2010, subject to data availability. To the best of our knowledge, this is the first data set to have such detailed information on local officials in China. Table

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[4]Source: http://cpc.people.com.cn/GB/64162/71380/71382/71480/4854129.html (in Chinese). Retrieved on March 9, 2018.

1 presents the summary statistics of the baseline variables in our data set.[5] Those variables are constructed from a raw data set that we manually collected.[6] The names of the variables in the raw data set are given in Table A2.

The baseline demographic characteristics include gender (male or female) and ethnicity (Han or other). The overwhelming majority of party secretaries in our data set are male Han (88% among party secretaries, 84% among mayors). There are about 3% (2%) female Han and 9% (13%) male non-Han among party secretaries (mayors). There are no female non-Han in our sample.

The education variables include a range of dummy variables for full-time and part-time degrees. For full-time educational degrees, we include dummy variables for college completion (*Completed College*), STEM majors (*STEM Major*), and attending an elite college (*Elite College*), which are highly selective universities in China.[7] Furthermore, we include a dummy variable indicating whether a local official entered college during the Cultural Revolution as a "Gong Nong Bing" college student (*College Entrance During 1971-77*), since the college admissions criteria were less academic and favored individuals with modest family backgrounds.[8] Similarly, we include a dummy variable that captures whether the local official was among the first two cohorts of college students selected immediately after the Cultural Revolution (*College Entrance in 1978)*,[9] indicating that the official had a strong academic background before entering college and received a higher quality college education.

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[5]Since we do not have unique identifiers for local officials in our data set, we collapse our data by the name of the local official and city. We have 313 observations for party secretaries and 330 for mayors. It is possible that some party secretaries and mayors serve in the city with the same post. For party secretaries, there are at most 14 such occurrences in our data set. To account for that, as well as any other correlation in local official selection at the city level, we cluster our standard errors by city when performing hypothesis testing in our empirical analysis.

[6]Both the cleaned and raw datasets are available upon request.

[7]We use the 1978 list of national key universities. The 88 listed universities include 16 comprehensive universities (e.g. Peking University), 51 science and technology institutes (e.g. Tsinghua University), 9 agricultural universities (e.g. Beijing Forestry University), 6 medical schools, 2 teachers' colleges, 2 foreign language schools, 1 law school, and 1 music conservatory.

[8]During the Cultural Revolution, the college admission criteria put less emphasis on academic standards and favored students from peasant and working-class families (Chang, 1974). Furthermore, much of the urban youth, who would otherwise enter college, were sent to rural areas to work. Hence, the first two college entrance exams after the Cultural Revolution were arguably the most competitive exams attracting many of those who were not allowed a university education during the Cultural Revolution.

[9]The first cohort of college students after the Cultural Revolution was called the 77-th cohort but they in fact entered college in Spring 1978. The second cohort entered college in Fall 1978.

In our sample, 60% (55%) of party secretaries (mayors) have completed a full-time college degree, 33% (31%) majored in a STEM field, and 27% (25%) attended an elite college. In terms of college entrance, 18% (17%) entered college between 1971-77 and 24% (22%) in 1978. For part-time educational degrees, we have two binary variables for whether the local official attended a part-time college regardless of college completion (*Part-time College*) and whether the local official obtained a part-time graduate degree (*Part-time Graduate Degree*). Among party secretaries (mayors), 38% (43%) have completed a part-time college degree or some part-time college, and 25% (19%) obtained a part-time graduate degree.

The baseline experience variables in our data set fall under three categories: (1) current post, (2) previous experience, and (3) previous locations. For the current post, we include tenure in the current post (*Years in Current Post*) and years to retirement (*Years to Retirement*), which are determined by an official's age and the ranking of the city, as well as a dummy for whether the current post is in the official's birth province (*Current Post in Birth Province*). The average party secretary (mayor) in our sample serves about 2.1 (1.94) years in the current position, and has about 5.53 (7.55) years to retirement.[10] About 58% (59%) of party secretaries (mayors) in our sample are currently posted in their birth province. For previous experience, we include indicator variables for industry experience (*Enterprise*) and research experience (*Research*), where the latter includes academic and non-academic research positions. About 41% (46%) of party secretaries (mayors) in our sample had previous enterprise experience, whereas 26% (25%) had previous research experience. Furthermore, we have a host of dummy variables for previous government positions held, *Administrator in Government or Party Organization, County Mayor, County Party Secretary, City Mayor, City Party Secretary*, and *Central Government*. Note that counties have a lower administrative ranking than cities in the Chinese system. Among party secretaries (mayors), 30% (37%) had been administrators in government or party organizations, 22% (28%) had served as county mayors, 32% (31%) as county party secretaries, 58% (17%) as city mayors, 28%

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[10]Note that the difference between years to retirement between secretaries and mayors is partly due to the fact that city party secretary is a step above city mayors. Hence, city party secretaries on average tend to be older.

(9%) as city party secretaries, and 16% (14%) had previous work experience in the central government. Finally, we have indicator variables for whether the current official's previous post was in the current city (*Current City*), current province (*Current Province*), or another province (*Other Province*). Almost everyone in our sample had a previous post in the same province as their current position. An overwhelming majority also had prior posts in the current city (81% among party secretaries, 89% among city mayors). About 27% (23%) of party secretaries (mayors) have served in a different province.

We also collect promotion data for party secretaries and mayors following their respective positions in the cities and years in our sample. Table 2 presents the probability of promotion to higher administrative positions as well as the probability of getting promoted to specific positions. Party secretaries are more than four times as likely to get promoted to higher administrative positions than mayors, specifically at 38% versus 8%. They are more than twice as likely to get promoted to province-level party and government positions as mayors, four times as likely to get promoted to a position in the province-level National People's Congress (NPC) or Chinese Communist Party Central Committee (CCPCC), twice as likely to get promoted to central government positions, slightly more likely to get promoted to the central politburo (at 3% versus 2%). Mayors are, on the other hand, about twice as likely to become the chief manager (party secretary) of a provincial department.

3.2. **Air Pollution and Economic Variables.** We use a city-level panel of daily PM_{10} concentrations for 111 cities from 2001-2010. The data is produced by the China National Environmental Monitoring Center (CNEMC), an affiliate of the Ministry of Environmental Protection of China, and is a mere compilation of the data reported by the city governments. The PM_{10} concentrations are piece-wise linearly transformed into an API index. The PM_{10} concentration cut-off corresponding to the blue-sky day is 0.15 parts per billion (ppb). Ghanem and Zhang (2014) have found evidence consistent with manipulation predominantly for PM_{10} concentrations, whereas such evidence was found to a much lesser degree for other criteria pollutants used for the construction of the API during the period we examine, SO_2 and NO_2. The economic variables are obtained from the China City Statistical Yearbooks

for 2001-2010. The summary statistics for PM_{10} concentrations as well as the economic variables we consider are given in Table 3.

4. Estimating the Proportion and Number of Manipulated Blue-sky Days

4.1. **Econometric Identification.** If both reported and true PM_{10} concentrations (hereafter PM_{10}) are observed for any given day, then the identification of data manipulation is trivial, since the proportion of data manipulation can be identified by comparing the reported and true PM_{10} distributions to the left of the threshold value, as demonstrated in Figure 1. In many empirical settings where misreporting is suspected, the distribution of the true variable is unobserved. Our empirical strategy relies on identifying the true distribution using knowledge of the cut-off that incentivizes data manipulation as well as a set of assumptions appropriate for our empirical setting.

Let X be the reported PM_{10} and Z a binary random variable that takes value 1 if the reported index is manipulated and 0 otherwise; X is observed while Z is not. Let c be the cut-off such that a day with $X \leq c$ is a reported blue-sky day. The reported PM_{10} is a combination of true and manipulated data. That is,

$$X = (1 - Z)X(0) + ZX(1),$$

where $X(0)$ is the true PM_{10} and $X(1)$ the manipulated PM_{10}. Let $\lambda = P(Z = 1)$ be the total proportion of PM_{10} manipulation.

To establish identification of λ, we make the following assumptions.

Assumption 1. $Z = 0$ if $X(0) \leq c$.

Assumption 2. $X(1) \leq c$.

Assumption 3. $P(Z = 1|X = x) = 0$ for all $x \notin [\underline{x}, \bar{x}]$, where $c \in [\underline{x}, \bar{x}]$ and $P(\underline{x} \leq X \leq \bar{x}) < 1$.

Assumption 4. The cdf of $X(0)$ is $G(.;\theta)$, where $G(.;\theta)$ is a known function with density $g(.;\theta)$ and θ an unknown finite-dimensional parameter.

Figure 2 provides a graphical illustration of the above assumptions. The first two assumptions follow naturally from our empirical setting. Since manipulation that does not switch a non-blue sky day to a blue-sky day carries no benefit to the local official, it is reasonable to assume that no manipulation occurs if the true PM_{10} concentration is already below the cut-off for blue-sky days (Assumption 1) and that all manipulation moves PM_{10} below the cut-off for blue-sky days (Assumption 2). To accommodate other empirical settings, one could allow manipulation to occur in the opposite direction. Hence, the key restrictions in these two assumptions are that manipulation is unidirectional, and that the direction of manipulation is known.

Assumption 3 is more restrictive, but is important to identify our objects of interest. As mentioned above, to identify the proportion of manipulation, we need to identify the distribution of the true PM_{10} concentration, or $X(0)$. Assumption 3 imposes that manipulation occurs only within a particular window around the blue-sky day cutoff. This allows us to observe the true concentration, $X(0)$, as a censored variable. Specifically, $X(0) = x$ for $x \notin [\underline{x}, c]$, and $X(0) = [x, \bar{x}]$ for $x \in [\underline{x}, c]$. We call $[\underline{x}, \bar{x}]$ the window of manipulation. Since local governments release the data on a daily basis to its citizens, who may detect large levels of misreporting and consequently protest, this assumption is reasonable for our empirical application.

Assumption 3 poses a key difference between our identification strategy and the polynomial fitting approach adopted by Chetty et al. (2011) and Ito and Sallee (2017). To quantify the excess bunching around kink points in Denmark's progressive income tax scheme, Chetty et al. (2011) assume a bunching window $[K - R, K + R]$ around the kink point K where the marginal tax rate changes. Furthermore, they assume that the bunching mass, or the excess number of individuals who locate near K, comes *proportionally* from $[K + R, \infty]$, or the right of the *upper end of the bunching window*. Similarly, to study the excess bunching of vehicle weights around kink points in Japanese government's tax incentive schedule, Ito and Sallee (2017) assume that the bunching mass comes from the left of the kink points. Similar to Chetty et al. (2011), Ito and Sallee (2017) also assume that an *equal proportion*

of cars move from the left to the kink points. The assumption of proportional mass shifting is definitely not appropriate in our setup. It might also be strong in Chetty et al. (2011) and Ito and Sallee (2017), as it is reasonable to expect that individuals or manufacturers of vehicles closer to the kink points are more likely to respond to the tax incentives implied by the kinks. Our Assumption 3, in contrast, does not impose any assumption on how the data mass shifts to the kink points.

Lastly, Assumption 4 assumes that the class of parametric distributions for the true PM_{10} concentration is known.[11] Assumption 4 appears to be restrictive, however, in the empirical analysis, we use a very board class of parametric distributions, the generalized beta distribution of the second kind (GB2) which nests a wide range of common distributions such as the generalized gamma, lognormal, Weibull, chi-square, half-normal, exponential, log-logistic, etc. This parametric class of distributions fits the air pollution data very well (see Section 4.2).

Now we illustrate the identification of λ from $G(.;\theta)$ and the distribution of the observed PM_{10}, denoted hereinafter by $F_X(.)$. We can decompose the probability of observing reported PM_{10} below the cut-off value c as follows

$$F_X(c) = E[1(X \leq c, Z = 0) + 1(X \leq c, Z = 1)$$

$$= E[1(X(0) \leq c, Z = 0) + 1(X(1) \leq c, Z = 1)]$$

$$= E[1(X(0) \leq c)] + E[1(Z = 1)] = G(c;\theta) + \lambda.$$

The second equality follows from the definition of X. The third equality follows from Assumptions 1 and 2. Since there is no manipulation below the cutoff c by the former assumption, the event $(X(0) \leq c)$ implies $(Z = 0)$. By the latter assumption, manipulation

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[11]Our need to specify the functional form of the distribution of true PM_{10} is related to Lee and Card (2008) where the specification of a parametric functional form is required to identify the local average treatment effect in the regression discontinuity design for discrete regressors. The key similarity is that in both situations we do not observe the continuous variable in question on its entire support. For the situation in Lee and Card (2008), they observe a discretized version of the continuous variable. For our setup, even if the reported data is continuous, we do not observe the true PM_{10} within the window of manipulation.

leads to a reported value that is below the cutoff c. Hence, the event $(Z = 1)$ implies that $(X(1) \leq c)$. The last equality holds following the definition of $G(c; \theta)$ and λ.

Therefore, the proportion of manipulation is given by $\lambda = F_X(c) - G(c; \theta)$. Likewise, one can show that the proportion of manipulation among reported blue-sky days satisfies

$$\mu = P(Z = 1 | X \leq c) = \frac{\lambda}{F_X(c)} = \frac{F_X(c) - G(c; \theta)}{F_X(c)},$$

where the second equality holds by Assumption 1.

The above identification result can be extended to settings where incentive structures are continuous but have kinks, such as "excess bunching". The relevant result is given in Appendix A. A well-studied example is bunching resulting from kinks in the net-of-tax budget constraints. In that setting, we often observe bunching in the data as opposed to a sharp discontinuity. Chetty et al. (2011) and Saez (2010) use different methods to measure "excess bunching". It is important to note here that such behavioral responses incorporate changes in the labor supply and may be present even in the absence of manipulation. For instance, Chetty et al. (2011) find evidence of bunching in their study of Danish tax records, even though the probability of manipulation of income is quite low due to third-party reporting.

It is worth noting that our identification strategy only captures manipulation around the cutoff of blue-sky days. There is anecdotal evidence that city governments use other methods to ameliorate the readings of air pollutant concentrations, such as choosing favorable locations for weather stations or taking measures to reduce pollutant concentrations around existing weather stations year round. Our method does not take such systematic manipulation behavior into account.

4.2. **Results.** Since the identification result is based on a parametric distributional assumption of a censored variable, the natural estimator of θ in this context is MLE. For city i in year t, let X_{itd} denote the reported PM_{10} concentration on day d. Let $G(x; \theta_{it})$ be the c.d.f. of the true PM_{10} value in city i at year t and $g(x; \theta_{it})$ be the corresponding p.d.f. As is discussed earlier, we use the GB2 distribution for its flexibility in estimating distributions of positive continuous random variables. The cutoff for blue-sky days is 0.15 for the PM_{10}

concentration. We set the manipulation window as $[\underline{x}, \bar{x}] = [0.135, 0.18]$. The censored maximum likelihood estimator is given by the following

$$\hat{\theta}_{it} = \arg\max_{\theta_{it} \in \Theta} \sum_{d=1}^{T_{it}} \left\{ 1\{x_{itd} \notin [\underline{x}, \bar{x}]\} \log g(x_{itd}; \theta_{it}) + 1\{x_{itd} \in [\underline{x}, \bar{x}]\} \log(G(\bar{x}; \theta_{it}) - G(\underline{x}; \theta_{it})) \right\},$$

where T_{it} is the total number of days observed for city i in year t.

Figures 3 - 4 illustrate the estimated c.d.f. of true PM_{10}, $G(.; \hat{\theta}_{it})$, as well as the empirical c.d.f. of daily reported PM_{10}, $\hat{F}_{X_{it}}(.)$, for Beijing, Shanghai, Chongqing, and Tianjin, the four provincial-level cities of China. The figures for all other cities in our data set are given in Supplementary Appendix I.

The proportion of manipulation among reported blue-sky days for a given city-year combination could then be estimated following

$$\hat{\mu}_{it} = \frac{\hat{F}_{X_{it}}(c) - G(c; \hat{\theta}_{it})}{\hat{F}_{X_{it}}(c)},$$

where c is the cutoff for blue-sky days, 0.15 ppb. Figures 5 - 6 plot the proportion of reported vs. predicted blue-sky days as well as the proportion of manipulation among reported blue-sky days for the four provincial-level cities between 2001-2010. The figures show the heterogeneity in the evolution of the proportion of manipulation over time. Supplementary Appendix II includes the plots for all other cities in our data set.

Finally, the total number of manipulated blue-sky days, $\hat{m}_{it}$, could be estimated following

$$\hat{m}_{it} = (\hat{F}_{X_{it}}(c) - G(c; \hat{\theta}_{it})) \cdot T_{it}.$$

To summarize our results across cities, Figure 7 presents the annual histograms for manipulated blue-sky days across cities. The histograms provide evidence of substantial heterogeneity from year-to-year in the number of blue-sky days that are manipulated by cities.

5. Local Leaders and Environmental Compliance in China

5.1. **Econometric Strategy.** We are interested in understanding which mayor and party secretary characteristics are the most important predictors of air quality data manipulation

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within cities. We have a fairly large number of mayor and party secretary characteristics in our data set, specifically 24 for each mayor and party secretary, i.e. a total of 48 variables. It is well-known that regressions with large numbers of covariates lead to spurious results, not to mention the danger of specification searching and p-hacking. We hence apply the LASSO shooting algorithm proposed by Belloni et al. (2014b) to select among the characteristics in our dataset. The main advantage of this procedure is that it delivers valid post-selection inference that is robust to model selection errors. The key assumption of the LASSO method is the approximate sparsity assumption, which means that the relationship between the outcome variable and regressors can be well approximated by a linear function of a small number of regressors. Since we have predominantly binary regressors that we interact, the linearity of the approximating function is not restrictive. Furthermore, the results illustrate that the sparsity assumption is appropriate for our empirical setting.

Let $z_{it}^{m,j}$ denote the jth mayor characteristic, and $z_{it}^{s,j}$ denote the jth party secretary characteristic in city i at year t. The LASSO model selection step is implemented on the following equation

$$y_{it} = \sum_{j=1}^{K} \beta_{m,j} z_{it}^{m,j} + \sum_{j=1}^{K} \beta_{s,j} z_{it}^{s,j} + \gamma_p + \delta_r + \lambda_t + u_{it},$$

where γ_p, δ_r and λ_t are province, city-rank and year fixed effects, respectively. These fixed effects are treated as control variables in the LASSO procedure and the variable selection is performed among all mayor and party secretary characteristics in our dataset.[12] We implement this procedure twice with the proportion of manipulation among reported blue-sky days ($\hat{\mu}_{it}$ in the previous section) and the total number of manipulated blue-sky days ($\hat{m}_{it}$ in the previous section) as the dependent variable. The post-LASSO regression includes all variables selected in the LASSO selection with either $\hat{\mu}_{it}$ or $\hat{m}_{it}$ as the dependent variable.[13]

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[12]For provincial level cities, such as Beijing, including province fixed effects is equivalent to including city fixed effects.

[13]The implementation here is similar to post-selection inference in treatment effects models (Belloni et al., 2014b), where selection is performed twice on the outcome variable and the treatment to avoid any omitted variable bias.

We also check the robustness of our post-LASSO results to the inclusion of city fixed effects in lieu of province and city-rank fixed effects.

5.2. **Post-LASSO Results and Robustness Checks.** The main finding from our LASSO results is that the only variable selected as a predictor of manipulation within cities is having a party secretary in power who obtained an undergraduate degree from an elite college, hereinafter PSEC (*Party Secretary Elite College*). Table 4 reports the LASSO selection results in Panel A and the post-LASSO results in Panel B. The LASSO selection procedure is performed using the data-dependent penalty level recommended in Belloni et al. (2014b).[14] Panel B also includes the fixed effects versions of the post-LASSO regressions, where city fixed effects are included in lieu of province and city-rank fixed effects, in addition to the year fixed effects. We find that having a party secretary with an elite college degree (PSEC=1) is associated with a 1.1% annual increase in the proportion of manipulation (2.38 manipulated blue-sky days), which is statistically significant at the 5% level. To put this finding into context, the average proportion of manipulation in our sample is 3.1% with a standard deviation of 4.3%. Hence, the average increase in the proportion of manipulation associated with PSEC is about 30% of the sample mean and about 25% of the standard deviation. The relative increases are similar for manipulated blue-sky days.

The first natural robustness check of our finding is to perform the LASSO procedure while excluding PSEC from the variables that are available for selection. In this case, no variables are selected, as presented in Table 5. This finding supports the importance of the PSEC variable as the key predictor and that it is not masking the prediction power of other variables. The other two robustness checks we perform reduce the number of control variables we include in the LASSO selection step as well as the penalty level. Both checks allow the LASSO to select more variables, so that we can examine if they affect the significance and magnitude of the coefficient of the PSEC variable.

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[14]Let N and K denote the sample size and the number of variables included for selection, respectively. The penalty level is given by $2\sqrt{2\log(KN)/N}$.

Table 6 reports the post-LASSO results for variables selected by LASSO using province and year fixed effects as controls (Columns 1-2) as well as province fixed effects as controls (Columns 3-4) for our two measures of manipulation as the dependent variable. In all variants of the LASSO, the PSEC variable is selected. Furthermore, the post-LASSO and fixed-effect PSEC coefficient estimate is even larger than our baseline results. It also maintains its statistical significance at least at the 5% level except in one case, Panel B(2), where it is significant at the 10% level. Furthermore, none of the other selected variables is statistically significant.

All of the above LASSO results rely on the data-driven penalty level proposed in Belloni et al. (2014b), which is 277.89 for our baseline regression. Tables 7-8 presents the post-LASSO results for variables selected by LASSO using lower penalty levels, specifically, 250, 200, 150, and 100. Note that for penalty levels 250 and 200, only PSEC is selected, hence their results are reported in a single column (1) followed by the city and year fixed effects regression in (2), which are identical to our baseline results. For lower penalty levels, specifically 150 and 100, which are about half or one-third of the theoretically recommended penalty level, several variables other than PSEC are selected. However, there are only two variables that are statistically significant at the 5% level in some of the regressions. Interestingly, both are party secretary characteristics. The first one is *College Entrance in 1978*, which is associated with a reduction in manipulation. The sign on this variable is intuitive, since this cohort faced arguably the most fierce competition in the college entrance exam as pointed out above, and hence is likely to be very highly capable. Another party secretary characteristic, *Previous Position in Current City*, is significant in Columns (3)-(6) in Table 8 with manipulated blue-sky days as the dependent variable, but not in Table 7 with the proportion of manipulation as the dependent variable. None of the LASSO variants entertained in both tables reduce the magnitude or statistical significance of the PSEC variable. On the contrary, its magnitude is larger and more statistically significant than our baseline results in both post-LASSO and city and year fixed effects regressions, respectively.

All of the above robustness checks confirm the importance of the party secretary's elite education as a significant predictor of city-level manipulation of air quality data. Now we proceed to examine heterogeneity in the PSEC variable and to interpret our results in the larger context of career concerns of Chinese local officials.

5.3. **PSEC, Manipulation, Economic Growth, and Promotion.** To interpret the LASSO regression results associated with the PSEC variable, we compare party secretaries with an elite college degree with all other party secretaries in Table 9. The difference between the two groups along the education variables is not surprising. Elite colleges tend to be oriented toward STEM fields. Furthermore, by definition elite college graduates have to complete their degree as full-time students. They are also less likely to pursue another college degree as a part-time student. Furthermore, the party secretaries that have elite degrees in our sample are twice as likely to have entered college during the Cultural Revolution (1971-77), specifically this cohort's proportion is 29% among elite college graduates, whereas it is only 14% among other college graduates.

Elite education is also significantly correlated with several experience variables. Specifically, elite educated party secretaries are 24% less likely to be currently posted in their birth province, suggesting geographical mobility, better political connection, and higher chance to receive a promotion in the future. In terms of previous work experience, elite educated secretaries are 12% more likely to have previous enterprise as well as research experience, 14% less likely to have served as county mayor, 19% less likely to have served as county party secretary, and 12% more likely to have been posted at the central government.[15] These differences suggest that party secretaries with elite college degrees are less likely to have to climb the promotion ladder from county-level positions to higher level positions, and hence tend to be appointed to city-level positions from outside the province. This further suggests that the PSEC variable encompasses several unobservable characteristics, including ability

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[15]Table A3 presents the same analysis for mayors. The key difference in this comparison is that mayors with and without elite college degrees are *not* significantly different in terms of college entrance during the cultural revolution, being posted in their birth province as well as previous experience in the central government. However, the former is significantly more likely to have entered college in 1978 and to have about two more years to retirement on average.

and connections. In order to understand which of these factors are more likely to be driving the relationship between manipulation and PSEC, we explore the heterogeneity in the relationship along these different dimensions.

Tables 10 - 11 present fixed effects regressions of the proportion of manipulation on the PSEC variable as well as its interactions with different party secretary attributes, such as gender, college cohort, major, tenure, and retirement as well as different previous experience variables. We find that among elite educated party secretaries, female Han are significantly less likely to manipulate relative to male Han and male non-Han. Regarding previous experience, having research experience also significantly reduces the proportion of manipulation relative to other elite educated party secretaries. Furthermore, prior experience as county mayor also reduces the probability of manipulation. The results with manipulated blue-sky days as the dependent variable presented in Tables 12 - 13 are similar in terms of the signs of the coefficients, but female Han and previous research experience do not have statistical significance.

The above results suggest that it is unlikely that the correlation between the PSEC variable and manipulation is driven by unobservable ability, given that previous research experience is associated with less manipulation. Furthermore, city party secretaries that previously served as county mayors are likely to have climbed the administrative ladder to arrive at the current post. They are less likely to be well connected in the political sphere. Hence, the interpretation of the PSEC variable in the context of manipulation is most consistent with PSEC capturing connections. This is consistent with previous literature (Jia and Li, 2017) that find the wage premium due to elite education in China is most likely associated with connections as well as signaling rather than technical ability.

We now turn to the relationship between economic growth and manipulation of air quality data. Despite the environmental targets set by the central government, economic growth is the primary criterion for promotion, especially for local party secretaries (Zheng et al., 2013). Hence, one potential explanation for our results is that elite educated party secretaries prioritize economic growth in order to achieve their goal of getting promoted. Manipulation

around the cut-off for blue-sky days then occurs to ensure that the city meets the minimum number of blue-sky days in a year, to hide the deterioration of air quality resulting from rapid economic growth, or to demonstrate consistent improvement in air quality over the years that the local official is in charge. Panel A of Table 14 presents the mean of economic indicators when an elite educated party secretary is in power and differences relative to other party secretaries. The former tend to be placed in cities with larger GDP, especially in the secondary and tertiary sectors. However, the differences are not statistically significant.

Panel B of Table 14 also presents the within-city correlation between the proportion of manipulation and GDP after accounting for time fixed effects. To compute these correlations, we first remove city-specific and time-specific unobservables from both the proportion of manipulation ($Z_{it}^1 = \alpha_i^1 + \lambda_t^1 + u_{it}^1$) and the economic variable in question ($Z_{it}^2 = \alpha_i^2 + \lambda_t^2 + u_{it}^2$). The correlation given in the table is the correlation between u_{it}^1 and u_{it}^2. Hence, it is neither confounded by city-specific unobservables nor general trends in manipulation or GDP. We find that conditional on having an elite educated city party secretary ($PSEC = 1$), the within-city correlation between GDP and the proportion of manipulation is positive, 0.11, whereas it is -0.03 when other college educated secretaries are in power ($PSEC = 0$). When we look at GDP by sector, we find similar correlation patterns for the secondary and tertiary sector, whereas the correlation is negative for the primary sector conditional on $PSEC = 1$ and positive conditional on $PSEC = 0$. The results are intuitive since the primary sector is not a major contributor to air pollution.

Since arguably the ultimate concern of local officials is their future career, we expect to see a difference in the correlation between promotion and manipulation for elite-educated and other party secretaries, specifically that the former is more positive than the latter. Table 15 presents the correlation between the proportion of manipulation and the promotion to higher administrative positions for elite-educated and other party secretaries. Since the probability of promotion is heterogeneous due to city-rank-specific or city-specific unobservables, we present the correlations controlling for heterogeneity in the mean at the city-rank level (I) and the city level (II). We find that manipulation and promotion are positively correlated,

specifically 0.11, for elite-educated party secretaries, whereas they are negatively correlated, specifically -0.05, for other party secretaries. When we look at the correlation between manipulation and promotion to specific positions, we find that this correlation differential is largest for those promoted to assume the role of the chief manager (party secretary) of a provincial department, specifically 0.15 for the elite-educated secretaries versus -0.01 for the non-elite educated secretaries. The correlation differential is also large for those promoted to other province-level party or government positions as well as province-level NPC/CCPCC. The correlation differential is very small for positions at the central government.[16] We also include the correlations controlling for city- and year-specific heterogeneity (III), which deliver qualitatively similar results.

5.4. **Discussion.** In order to understand our finding regarding the role of party secretaries in the manipulation of air quality data, we further examine their career concerns and their role in managing cities. In general, a party secretary has a higher incentive for promotion than a mayor, since they are one step closer to moving up in the administrative rank, which is illustrated in the promotion summary statistics in Table 2. For example, a prefecture-level party secretary can advance to the sub-provincial level in the next promotion. In contrast, a mayor is usually promoted as the local party secretary, which is at the same administrative rank as the mayor in most cities. There is also time pressure to advance in rank, since the Chinese political system has strict requirements on age, and the retirement age is pushed back for officials with higher administrative rank. The career of a government official is hence shadowed if he/she cannot advance to a particular level by a certain age.

A party secretary also faces much tougher competition in the promotion tournament. Most mayors can be promoted to a party secretary position in the same or different jurisdiction. The career advancement, even if it remains at the same administrative rank, is almost certain following the retirement or career advancement of the party secretary. In comparison, the promotion of a party secretary is more uncertain, especially as he/she advances in rank.

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[16]Table 2 illustrates that the proportion of promotions to central government positions is only 6%, hence the relevant correlation differential should be interpreted with caution. We do not compute the correlations for the promotion to central politbureau since the proportion of promotions to such a position is only 3%.

There are simply much fewer positions at the higher levels. Party secretaries must compete with their counterparts in other jurisdictions to get promoted.

It is unlikely that the promotion is only determined by the rank of performance indicators, aka the meritocracy model. The higher-level party leader has the power to decide whom to promote. Therefore, local officials are not working to maximize some index to be ranked higher. Instead, they strive to achieve satisfying scores for every single category to qualify for a promotion. The leadership of the communist party is best illustrated by controlling the personnel instead of relying on a promotion formula. The indicators help the party identify those qualified candidates but the final selection is based on political considerations. A local official with an obvious weakness, e.g. non-compliance with environmental standards, risks being found ineligible for promotion. Therefore, although environmental performance is arguably a less important indicator compared with GDP, local officials strive to comply with the environmental targets because pollution can be a 'stain' on their resumé.

The party secretary sets the overall strategy of economic development and environmental protection, which is then implemented by the mayor. For a city to achieve the economic target set by the higher-level government while complying with environmental standards, the only option may be to allow the data to be manipulated, at least in the short run. Although a party secretary is unlikely to instruct local government officials directly to falsify the data, the pressure of environmental compliance without resource commitment may force the officials in local environmental protection bureaus to do so. Because the promotion of most city officials is subject to the party secretary, local officials will cave in to meet the implicit demand of the local leader. This suggests that the party secretary has a critical, though implicit role in condoning the manipulation of air quality data.

Furthermore, a mayor cannot engage in data manipulation without the implicit permission of the party secretary, otherwise the mayor risks being subjected to disciplinary action. On the other hand, a mayor has little or no incentive to stop the party secretary from allowing data manipulation because the mayor will also benefit from a beautiful local performance

record. The promotion of the party secretary vacates the top leadership position for the mayor. All of the above sheds light on our finding that data manipulation is largely determined by city party secretaries' attributes rather than mayors' attributes.

6. Conclusion

China's approach to incentivize local officials to comply with the goals and targets set by the central government partially explains China's rapid economic growth in the past forty years. However, this approach also creates some unintended consequences, including falsification of the data used to evaluate local officials. Using air pollution data manipulation as an example, this paper illustrates how local officials might respond to the incentive by cheating instead of exerting effort. Specifically, we propose in this paper an innovative method to quantify the extent of manipulation of air quality data and then determine its key predictors among a large number of characteristics of city party secretaries and mayors. We find that the key predictive factor of city-level data manipulation is to have a party secretary in power with an elite college degree. This is likely due to the fact that the elite college educated party secretaries have a higher chance of future promotion. When environmental compliance is at conflict with GDP growth, those who have most to gain from an 'un-stained' compliance record are more likely to turn a blind eye with regards to local data manipulation. This result challenges the theory that meritocratic promotions can select competent leaders.

Appendix A. Identification of Excess Bunching

The key difference between the data bunching problem studied in, for example, Saez (2010), and the data manipulation problem studied in Section 4.1 of the paper is that in data bunching the 'movement' of data, although still unidirectional, is not restricted to shifting data from the right of the cut-off c to the left of the cut-off. Specifically, a kink in tax policy, say, increased marginal tax rate after cut-off value c may incentivize workers to reduce their work efforts, or to misreport their earnings when filing their tax returns. But many taxpayers, as is reasoned in Saez (2010), are unable to perfectly control their incomes or may not be aware of the exact location of kink points. Therefore, researchers typically observe a bunching pattern in data around the cutoff c as opposed to a discontinuity in density in the data manipulation case. For the data bunching problem, we replace both Assumption 1 and 2 in Section 4.1 with the following assumption.

Assumption 5. $X(1) \leq \tilde{c}$, where $\tilde{c} \in (\underline{x}, \bar{x})$, $f_X(\tilde{c}) = g(\tilde{c}; \theta)$ and $f_X(x) \neq g(x; \theta)$ for all $x \in (\underline{x}, \bar{x}) \backslash \tilde{c}$.

Since the probability mass in data bunching is not simply moving from the right to the left of the cutoff, we can no longer identify the probability of manipulation, or λ, from $F_X(c) - G(c; \theta)$. Instead, we can identify the proportion of individuals responding to the tax policy using the following quantity

$$\lambda_b = \int_{\underline{x}}^{\bar{x}} (f_X(x) - g(x; \theta))^+ dx,$$

where $h(x)^+ = h(x)1\{h(x) > 0\}$, $f_X(x)$ is the probability density function of the observed data with progressive tax schedule and $g(x; \theta)$ is the probability density function of the hypothetical situation with constant marginal tax rate. Note that $f_X(x)$ could be estimated by nonparametric kernel density estimation and $g(x; \theta)$ could be estimated by parametric censored MLE following the discussions in Section 4.1. If Assumption 5 does not hold, then we can only identify a lower bound for λ_b.

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TABLE 1. Party Secretary and Mayor Characteristics: Summary Statistics

Sample Mean (S.D.)	Secretary	Mayor
Demographic Characteristics		
Male Han	0.88	0.84
Female Han	0.03	0.02
Male non-Han	0.09	0.13
Education		
Full-time		
Completed College	0.60	0.55
STEM Major	0.33	0.31
Elite College	0.27	0.25
Entered College Between 1971-77	0.18	0.17
Entered College in 1978	0.24	0.22
Part-time		
College	0.38	0.43
Graduate Degree	0.25	0.19
Experience		
Years in Current Post	2.10	1.94
	(1.41)	(1.50)
Years to Retirement	5.53	7.55
	(3.74)	(4.40)
Current Post in Birth Province	0.58	0.59
Previous Experience		
Enterprise	0.41	0.46
Research	0.26	0.25
Administrator in Gov't or Party Organization	0.30	0.37
County Mayor	0.22	0.28
County Party Secretary	0.32	0.31
City Mayor	0.58	0.17
City Party Secretary	0.28	0.09
Central Government	0.16	0.14
Location of Previous Posts		
Current City	0.81	0.89
Current Province	0.98	1.00
Other Province	0.27	0.23
# Observations	313	330

Notes: The above table lists the total number of observations we have. Due to data availability, we have some missing observations for some variables. However, the smallest number of observations we have for any variable is 304 for party secretaries and 311 for mayors.

TABLE 2. Probability of Promotion of Secretaries and Mayors to Various Positions in our Sample

	Secretary	Mayor
Promoted to Higher Admin. Position	0.38	0.08
Promoted to:		
Province-level Party/Government	0.42	0.16
Province-leve NPC/CCPCC	0.22	0.05
Chief Manager (Party Secretary) of Provincial Dept	0.07	0.13
Central Government	0.06	0.03
Central Politbureau	0.03	0.02
# Observations	932	

TABLE 3. Pollution and Economic Variables: Summary Statistics

	Mean	S.D.	Min	Max
PM$_{10}$ concentration	0.10	0.06	0.01	0.51
GDP (100 million yuan)	1,522.61	1,895.13	45.20	17,166.00
GDP by Sector (100 million yuan)				
Primary	102.50	82.65	0.55	685.40
Secondary	748.71	854.83	23.26	7,218.30
Tertiary	661.06	1,049.26	8.48	10,600.80
# Observations	983			

FIGURE 1. Discontinuity vs. Proportion of Manipulation
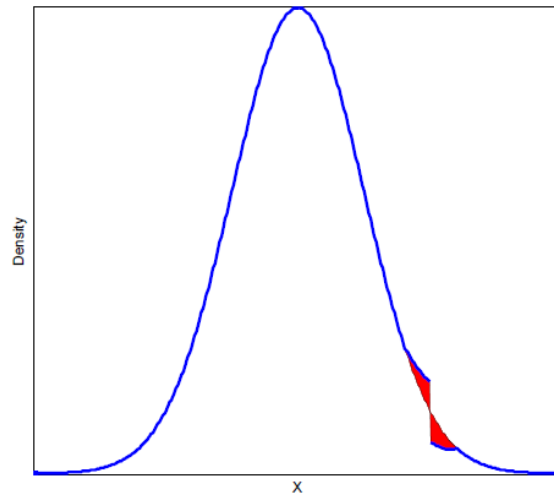
Panel A.
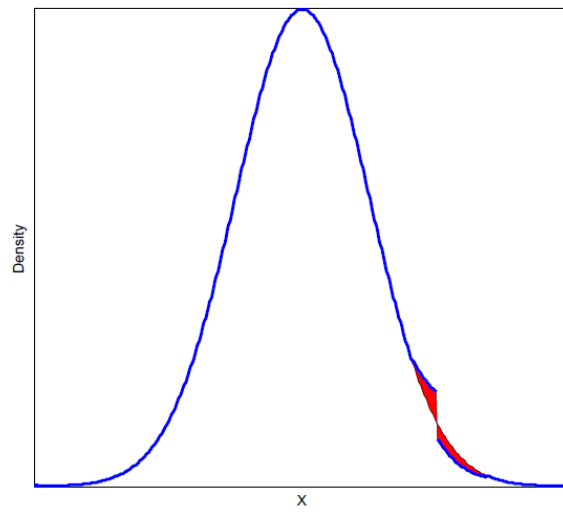
Panel B.

Notes: Panel A and B give two situations where the proportion of manipulation is the same, but the pattern of manipulation, i.e. which parts of the support of X and by how much they are manipulated. Specifically, in the top panel, the pattern of manipulation is symmetric around the cutoff, whereas in the bottom panel it is not. The thick blue line is the observed distribution of X, the shaded red area on either left or right side of the cutoff is proportion of manipulation. As a result, the vertical distance between the left and right limit at the discontinuity, which is used in McCrary (2008), which was used in Ghanem and Zhang (2014), is not the same due to the different pattern of manipulation, even though the proportion of manipulation is identical.

FIGURE 2. Econometric Identification of the Distribution of Unmanipulated PM_{10} Concentrations

Panel A.

Panel B.

Panel C.
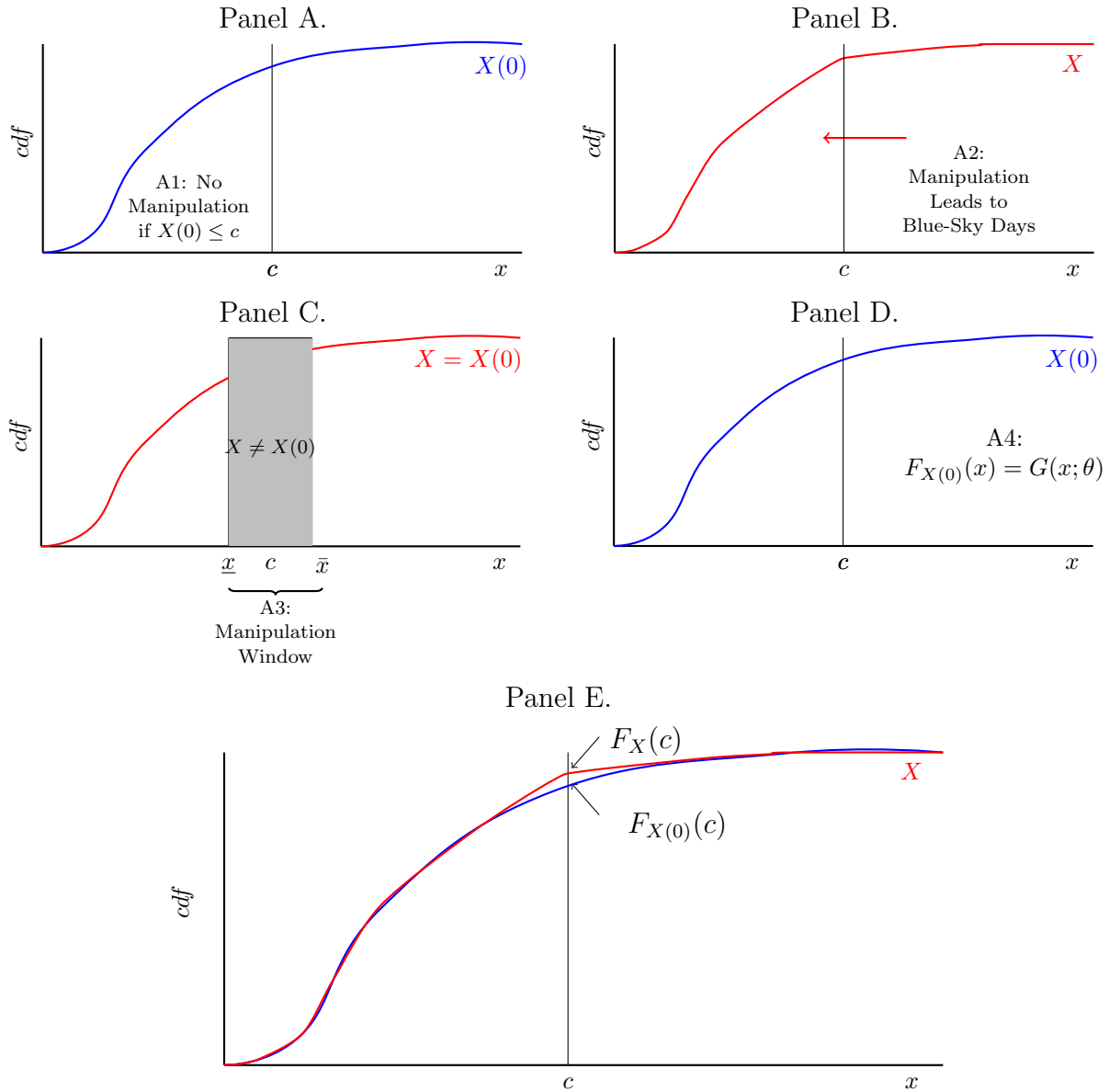
Panel D.

Panel E.

Notes: Panels A-D provide a graphical illustration of our identification assumptions, Assumption 1 - Assumption 4, which we refer to in the above as A1-A4. Panel E illustrates how once we identify the counterfactual distribution $F_{X(0)}$, we can identify the proportion of manipulation $F_X(c) - F_{X(0)}(c)$.

FIGURE 3. Empirical vs. Censored MLE PM$_{10}$ Distribution: Beijing and Shanghai
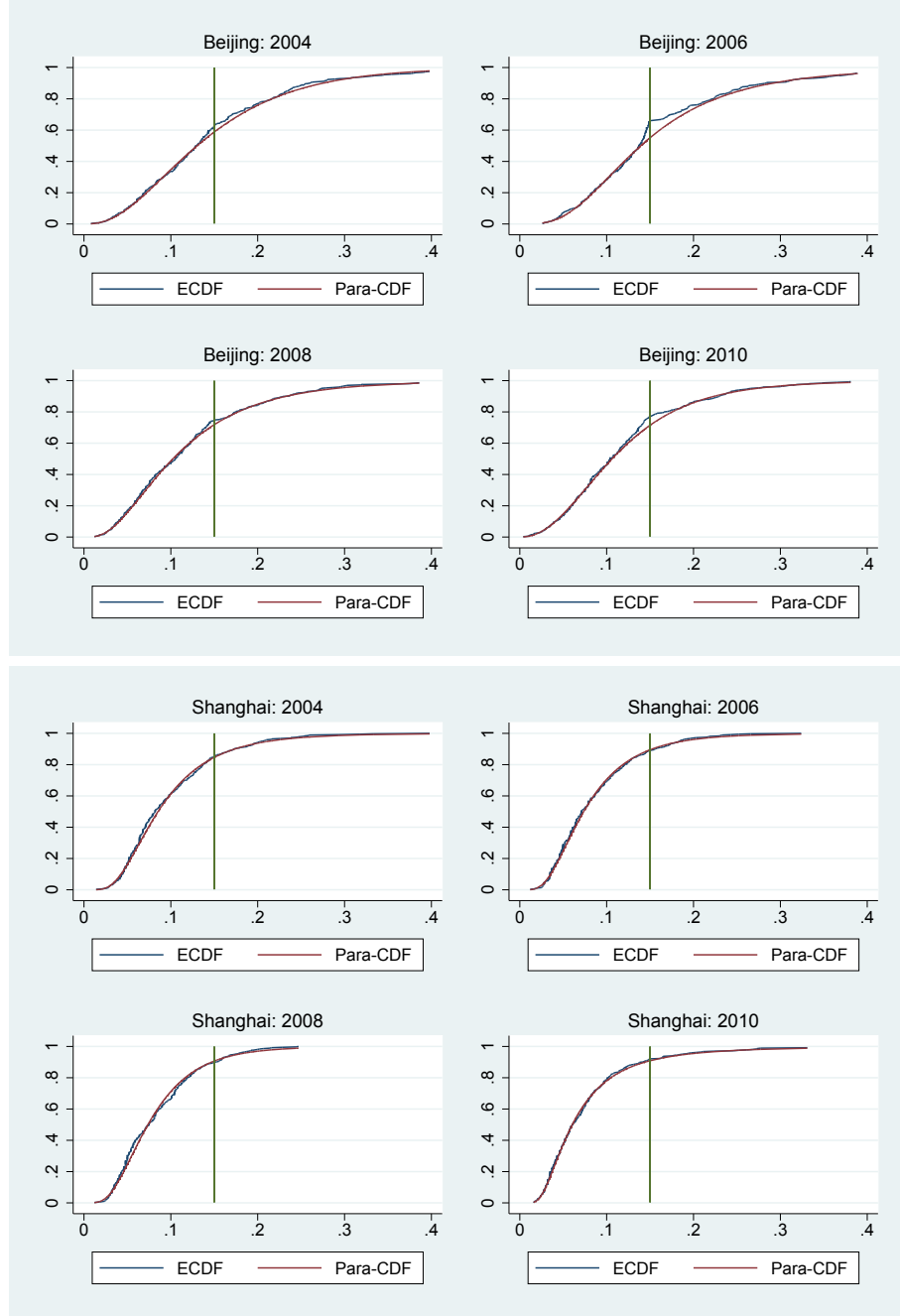
Notes: *ECDF* denotes the empirical CDF of the reported PM$_{10}$ concentrations, whereas *Para-CDF* denotes our parametric CDF estimate of the true PM$_{10}$ concentrations, which is estimated using using the censored MLE procedure. The vertical green line marks the cut-off for blue-sky days (0.15ppb).

FIGURE 4. Empirical vs. Censored MLE PM$_{10}$ Distribution: Chongqing and Tianjin
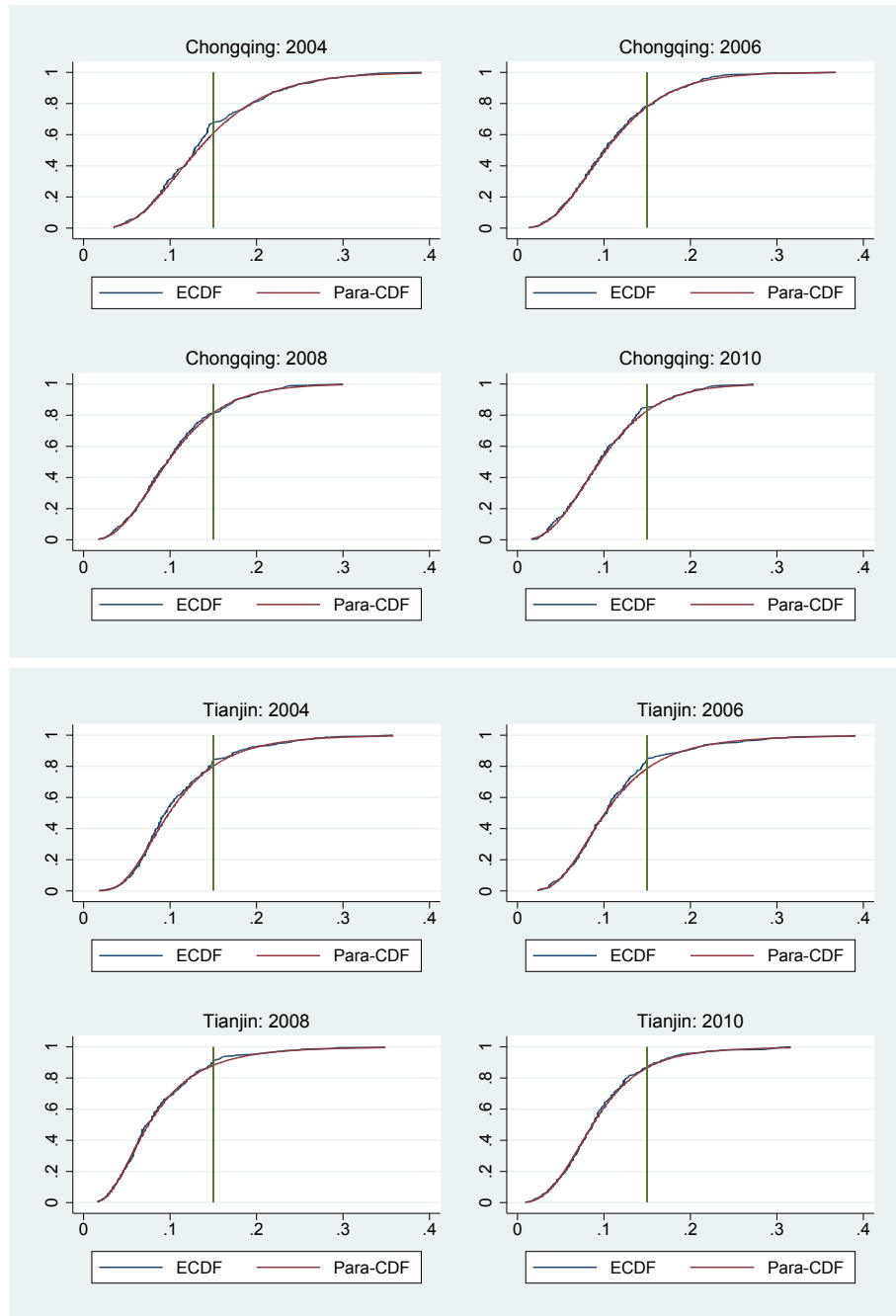
Notes: *ECDF* denotes the empirical CDF of the reported PM$_{10}$ concentrations, whereas *Para-CDF* denotes our parametric CDF estimate of the true PM$_{10}$ concentrations, which is estimated using the censored MLE procedure. The vertical green line marks the cut-off for blue-sky days (0.15ppb).

FIGURE 5. Reported vs. Estimated Blue-sky Days: Beijing and Shanghai
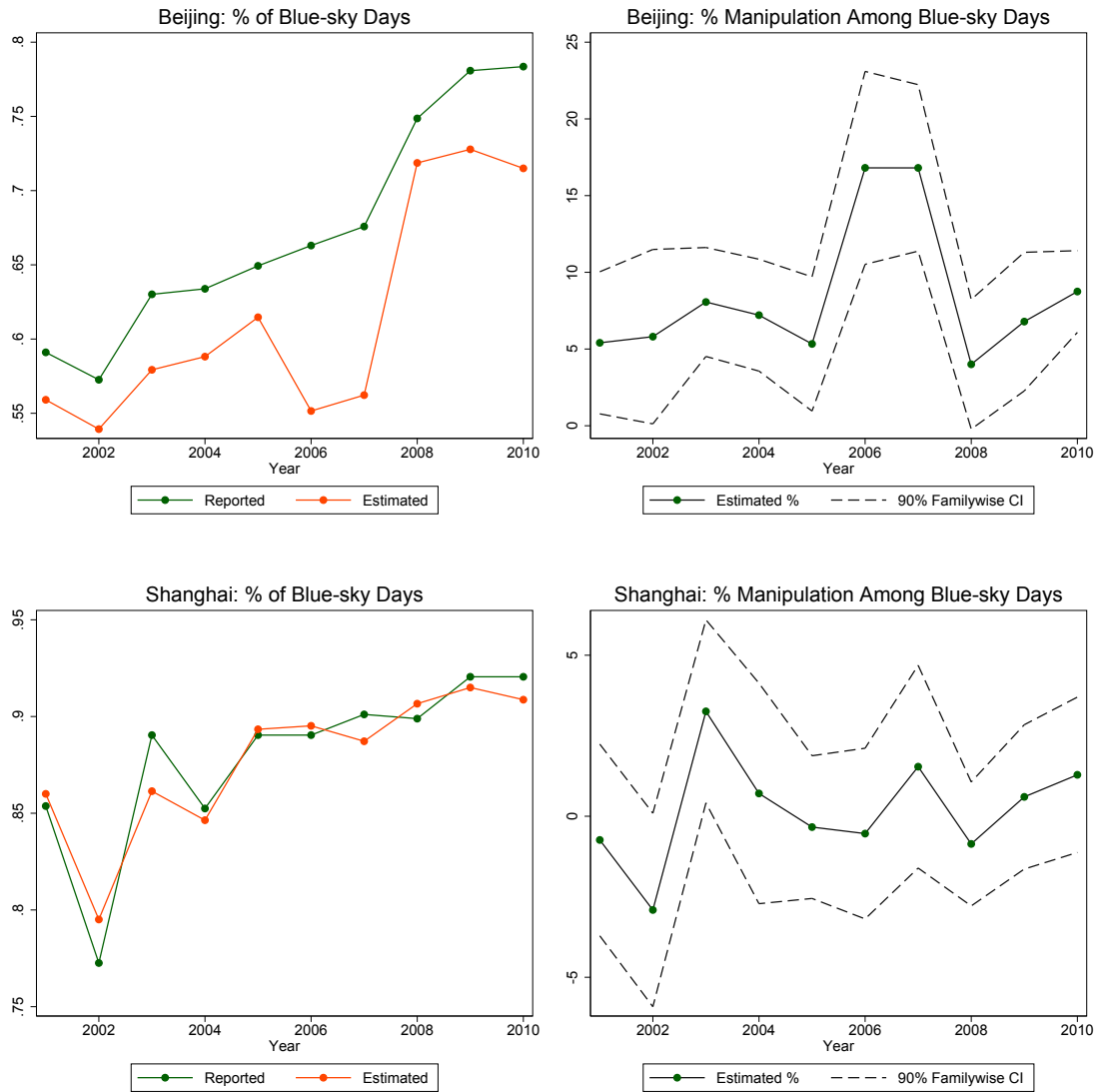
Notes: For each city, the left panel plots the time series of the proportion of blue-sky days in a year using the reported PM_{10} concentration data and the estimated true PM_{10} concentration distribution. The right panel plots the time series of the estimated proportion of manipulation among blue-sky days in a year. The 90% family-wise confidence intervals are calculated using a non-overlapping block-bootstrap procedure with 7-day block length and 100 bootstrap replications.

FIGURE 6. Manipulated vs. Reported Blue-sky Days and the Proportion of Manipulation: Chongqing and Tianjin
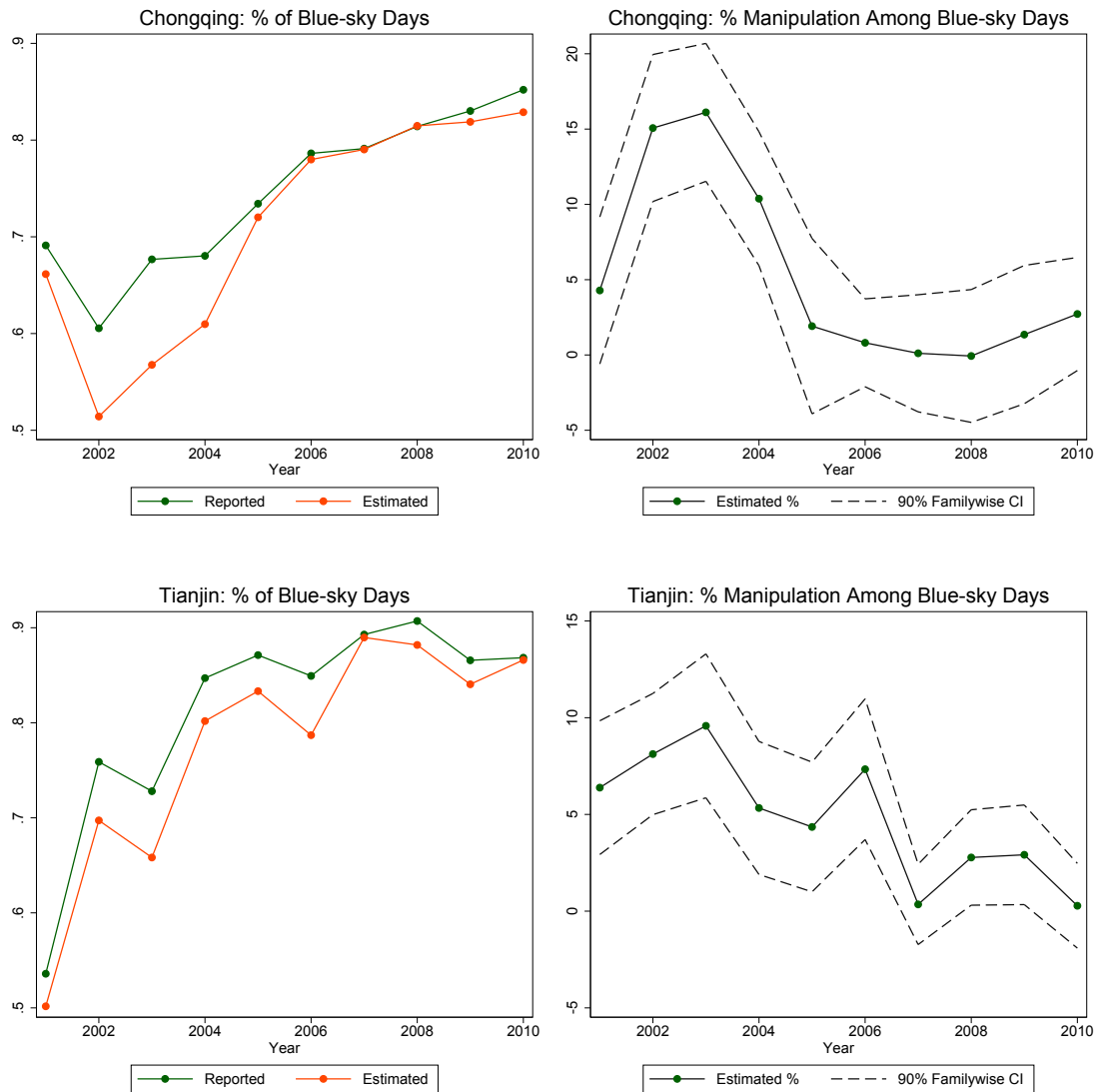
Notes: For each city, the left panel plots the time series of the proportion of blue-sky days in a year using the reported PM_{10} concentration data and the estimated true PM_{10} concentration distribution. The right panel plots the time series of the estimated proportion of manipulation among blue-sky days in a year. The 90% family-wise confidence intervals are calculated using a non-overlapping block-bootstrap procedure with 7-day block length and 100 bootstrap replications.

FIGURE 7. Annual Histograms of the Number of Manipulated Days by Year
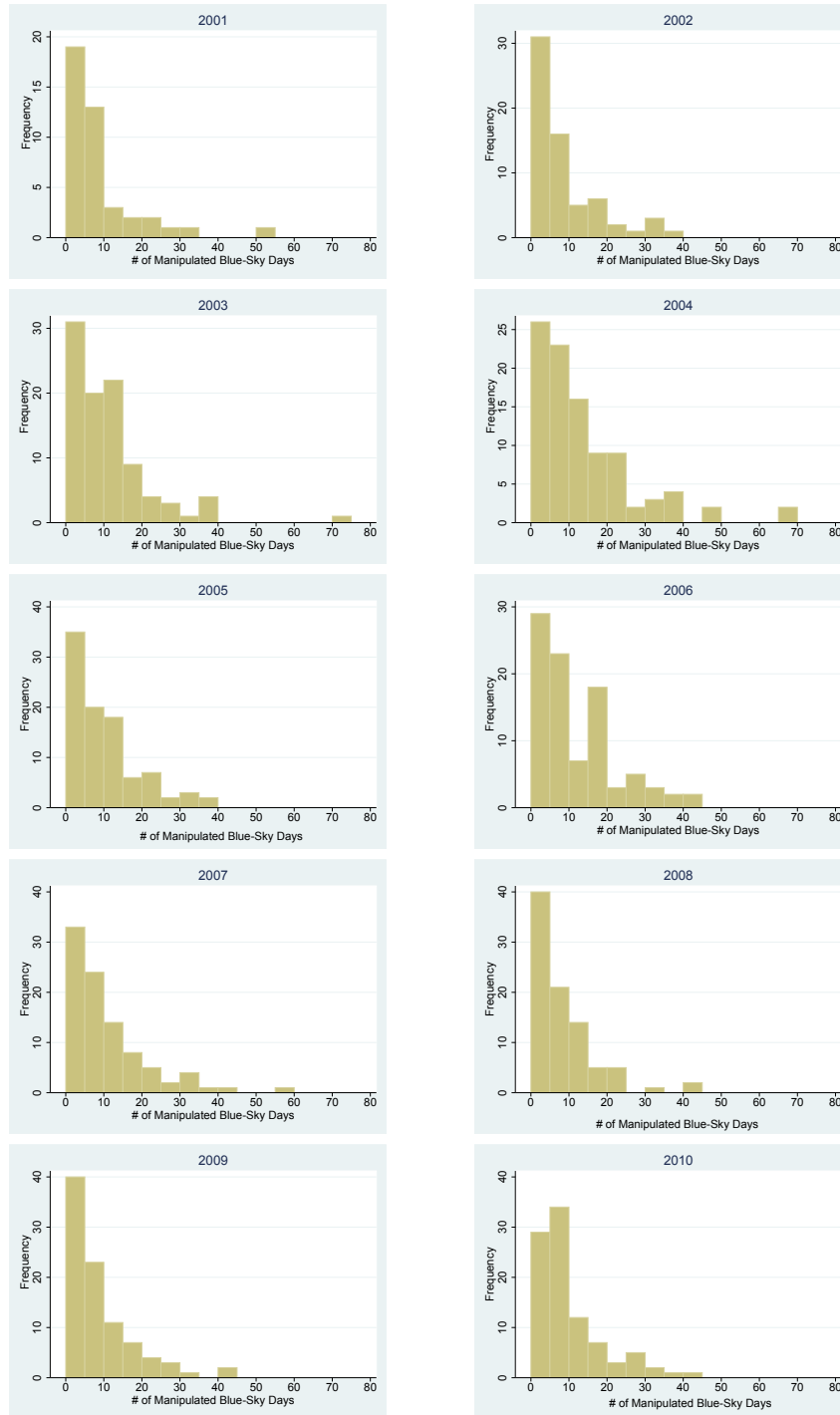
Notes: Since we estimate the number of manipulated blue-sky days without imposing a non-negativity constraint, we obtain a few negative, but statistically insignificant, estimates. In the above histograms, we only includes cities with non-negative estimates of the number of manipulated blue-sky days.

TABLE 4. Manipulation and Characteristics of City Officials
LASSO Results

Panel A. LASSO SELECTION STEP

Dependent Variable:	Proportion of Manipulation	Manipulated Blue-Sky Days
Variables Selected by LASSO		
Party Secretary Variables	Elite College	Elite College
Mayor Variables	None	None
Variables Included for Selection		
Party Secretary Demographic, Education and Experience Variables	Yes	Yes
Mayor Demographic, Education and Experience Variables	Yes	Yes
Variables Included as Controls		
Province Fixed Effects	Yes	Yes
City-rank Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes

Panel B. POST-LASSO & FIXED EFFECTS REGRESSION

Dependent Variable:	Proportion of Manipulation		Manipulated Blue-Sky Days	
	(1)	(2)	(3)	(4)
Party Secretary with Elite College Degree (PSEC)	0.0128 (2.47)	0.0111 (2.06)	2.788 (2.41)	2.378 (2.00)
Post-LASSO Regression with Province, City-Rank and Year Fixed Effects	Yes		Yes	
Regression with City & Year Fixed Effects		Yes		Yes
Sample Mean of Dependent Variable (S.D.)	0.031 (0.043)	0.031 (0.043)	8.507 (10.553)	8.507 (10.553)
# Observations	983	983	983	983

Notes: *t*-statistics are reported in parentheses. Cluster-robust standard errors at the city level are used in (2) and (4).

Table 5. Manipulation and Characteristics of City Officials
Robustness Check I

LASSO SELECTION STEP WITHOUT PSEC

Dependent Variable:	Proportion of Manipulation	Manipulated Blue-Sky Days
Variables Selected by LASSO:		
Party Secretary Variables	None	None
Mayor Variables	None	None
Variables Included for Selection		
Party Secretary Demographic, Education and Experience Variables	ALL Except PSEC	ALL Except PSEC
Mayor Demographic, Education and Experience Variables	ALL	ALL
Variables Included as Controls		
Province Fixed Effects	Yes	Yes
City-rank Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes

Notes: PSEC abbreviates Party Secretary Elite College Variable.

TABLE 6. Robustness Check II: Varying the LASSO Control Variables

PANEL A. *Dependent Variable*: Proportion of Manipulation

	(1)	(2)	(3)	(4)
PSEC	0.016	0.013	0.013	0.013
	(2.74)	(2.14)	(2.13)	(2.27)
Other Party Secretary Characteristics				
Previous Experience as City Party Secretary	0.002	-0.005		
	(0.47)	(-0.98)		
Mayor Characteristics				
Previous Experience as City Party Secretary	0.007	-0.008	0.003	-0.008
	(0.90)	(-0.85)	(0.37)	(-0.85)
Previous Position in Other Province			0.007	-0.000
			(1.36)	(-0.05)
Post-LASSO	Yes		Yes	
City & Year Fixed Effects		Yes		Yes
# Observations	919	919	940	940

PANEL B. *Dependent Variable*: Manipulated Blue-Sky Days

	(1)	(2)	(3)	(4)
PSEC	3.432	2.385	3.069	2.612
	(2.60)	(1.92)	(2.22)	(2.14)
Other Party Secretary Characteristics				
Previous Experience as City Party Secretary	0.776	-1.093		
	(0.68)	(-1.00)		
Mayor Characteristics				
Previous Experience as City Party Secretary	1.408	-2.513	1.765	-2.456
	(0.98)	(-1.34)	(1.08)	(-1.33)
Previous Position in Other Province			1.080	-0.792
			(0.96)	(-0.69)
Post-LASSO	Yes		Yes	
City & Year Fixed Effects		Yes		Yes
# Observations	919	919	940	940

Notes: (1) and (2) include regressors selected using LASSO with only province and time fixed effects as controls, (3) and (4) include regressors selected using LASSO with only province fixed effects as controls. The t statistics are given in parentheses. Cluster-robust standard errors at the city level are used in (2) and (4).

TABLE 7. Robustness Check III: Relaxing the LASSO Penalty Level

Dependent Variable:	Proportion of Manipulation					
	(1)	(2)	(3)	(4)	(5)	(6)
Penalty Level	250/200	250/200	150	150	100	100
PSEC	0.013	0.011	0.015	0.014	0.015	0.013
	(2.47)	(2.06)	(2.88)	(2.56)	(2.98)	(2.58)
Male Han			0.007	0.005	0.003	-0.001
			(1.26)	(0.76)	(0.39)	(-0.11)
Female Han					-0.009	-0.012
					(-0.85)	(-1.05)
College Entrance in 1978			-0.008	-0.009	-0.009	-0.010
			(-2.06)	(-2.04)	(-2.36)	(-2.41)
Part-time Graduate Degree					-0.003	-0.002
					(-0.88)	(-0.61)
Previous Position in Current City			0.005	0.005	0.006	0.005
			(1.40)	(1.35)	(1.58)	(1.31)
Previous Experience as City Party Secretary					-0.002	-0.006
					(-0.47)	(-1.14)
– as City Mayor					-0.005	-0.003
					(-1.33)	(-0.87)
– as County Mayor					0.000	-0.003
					(0.05)	(-0.48)
Mayor Characteristics						
Female Han					0.017	0.015
					(1.82)	(1.42)
STEM Major					0.007	0.006
					(1.32)	(1.26)
Elite College					0.001	0.000
					(0.23)	(0.10)
Previous Position in Other Province					0.003	0.000
					(0.61)	(0.01)
Previous Experience as City Party Secretary					-0.001	-0.008
					(-0.08)	(-0.84)
– as County Party Secretary			0.001	0.000	0.004	0.002
			(0.37)	(0.12)	(0.99)	(0.61)
– as County Mayor			0.005	0.004	0.006	0.005
			(1.01)	(0.89)	(1.14)	(0.98)
Years to Retirement					-0.001	-0.000
					(-1.39)	(-0.90)
Post-LASSO	Yes		Yes		Yes	
City & Year Fixed Effects		Yes		Yes		Yes
# Observations	983	983	942	942	918	918

Notes: The above columns report the post-lasso results using different penalty levels as well as the city fixed effects versions of them. The *t* statistics are given in parentheses. Cluster-robust standard errors at the city level are used in (2), (4) and (6).

Table 8. Robustness Check III: Relaxing the LASSO Penalty Level

Dependent Variable:	Manipulated Blue-Sky Days					
	(1)	(2)	(3)	(4)	(5)	(6)
Penalty	250/200	250/200	150	150	100	100
PSEC	2.788	2.378	3.126	2.822	2.957	2.425
	(2.41)	(2.00)	(2.74)	(2.36)	(2.64)	(2.11)
Other Party Secretary Characteristics						
Male Han			1.568	0.992	1.031	0.328
			(1.22)	(0.73)	(0.66)	(0.20)
Female Han					-0.324	-0.461
					(-0.12)	(-0.17)
College Entrance in 1978			-1.617	-1.722	-1.877	-2.092
			(-1.65)	(-1.66)	(-2.08)	(-2.10)
Part-time Graduate Degree					-0.136	-0.0357
					(-0.16)	(-0.04)
Previous Position in Current City			1.943	1.837	2.238	1.913
			(2.34)	(2.21)	(2.57)	(2.21)
Previous Experience as City Party Secretary					-0.262	-1.066
					(-0.24)	(-0.86)
– as City Mayor					-1.274	-0.988
					(-1.40)	(-1.01)
– as County Mayor					-0.0359	-1.020
					(-0.03)	(-0.78)
Mayor Characteristics						
Female Han					3.490	2.974
					(2.12)	(1.30)
STEM Major					1.533	1.425
					(1.36)	(1.25)
Elite College					0.838	0.579
					(0.74)	(0.53)
Previous Position in Other Province					0.224	-0.700
					(0.22)	(-0.60)
Previous Experience as City Party Secretary					-0.796	-2.517
					(-0.44)	(-1.20)
– County Party Secretary			0.611	0.453	1.221	0.923
			(0.66)	(0.46)	(1.27)	(0.89)
– as County Mayor			1.053	0.922	1.116	0.812
			(0.91)	(0.75)	(0.90)	(0.62)
Years to Retirement					-0.134	-0.088
					(-1.56)	(-1.00)
Post-LASSO	Yes		Yes		Yes	
City & Year Fixed Effects		Yes		Yes		Yes
# Observations	983	983	942	942	918	918

Notes: The above columns report the post-lasso results using different penalty levels as well as the city fixed effects versions of them. The *t* statistics are given in parentheses. Cluster-robust standard errors at the city level are used in (2), (4) and (6).

TABLE 9. Comparison between Party Secretaries by Elite College Degree

	Elite College	Elite − Other Difference	t-Stat
Demographic Characteristics			
Male Han	0.89	0.01	0.23
Female Han	0.02	0.00	-0.10
Male non-Han	0.08	-0.01	-0.19
Education			
Full-Time			
Completed College	1.00	0.54	18.21
STEM Major	0.61	0.38	6.51
Entered College Between 1971-77	0.29	0.15	3.07
Entered College in 1978	0.28	0.05	1.01
Part-time			
College	0.24	-0.20	-3.85
Graduate Degree	0.26	0.01	0.25
Experience			
Years in Current Post	2.21	0.14	0.80
Years to Retirement	6.01	0.66	1.57
Current Post in Birth Province	0.41	-0.24	-4.04
Previous Experience			
Enterprise	0.50	0.12	2.04
Research	0.35	0.12	2.05
Administrator in Gov't or Party Organization	0.29	-0.02	-0.31
County Mayor	0.12	-0.14	-2.99
County Party Secretary	0.18	-0.19	-3.85
City Mayor	0.52	-0.08	-1.17
City Party Secretary	0.25	-0.03	-0.60
Central Government	0.24	0.12	2.07
Location of Previous Posts			
Current City	0.78	-0.03	-0.83
Current Province	0.96	-0.02	-1.27
Other Province	0.35	0.11	1.89
# Observations			313

Notes: t-statistics are computed using standard errors clustered at the city level.

TABLE 10. Heterogeneity in the PSEC Variable: Proportion of Manipulation I

	(1)	(2)	(3)	(4)	(5)
PSEC	0.0111	0.0125	0.0116	0.0206	0.0105
	(2.14)	(1.86)	(1.53)	(1.49)	(1.57)
Interacted with					
Demographic Characteristics					
Male non-Han	0.00601				
	(0.30)				
Female Han	-0.0167				
	(-2.90)				
Education					
Entrance During 1971-77		0.00690			
		(0.86)			
Entrance in 1978		-0.00985			
		(-1.30)			
STEM Major			-0.000958		
			(-0.10)		
Experience					
Years in Current Post				-0.00163	
				(-0.69)	
Years to Retirement				-0.000921	
				(-0.76)	
Previous Experience					
Enterprise					0.000967
					(0.13)
Sample Mean of Dependent Variable	0.031	0.031	0.031	0.031	0.031
(S.D.)	(0.043)	(0.043)	(0.043)	(0.043)	(0.043)
# Observations	983	983	983	979	967

Notes: All regressions include city and year fixed effects. *t*-statistics in parentheses are computed using standard errors clustered at the city level.

TABLE 11. Heterogeneity in the PSEC Variable: Proportion of Manipulation II

	(1)	(2)	(3)	(4)	(5)
PSEC	0.0175	0.0152	0.0105	0.0110	0.0361
	(2.61)	(2.74)	(1.21)	(1.83)	(2.05)
Interacted with					
Previous Experience					
Research	-0.0196				
	(-2.01)				
County Party Secretary Only		-0.00935			
		(-0.94)			
County Mayor Only		-0.0652			
		(-4.16)			
Both County Party Secretary & Mayor		0.0264			
		(1.04)			
City Party Secretary Only			0.0290		
			(1.37)		
City Mayor Only			-0.00679		
			(-0.76)		
Both City Party Secretary & Mayor			-0.00507		
			(-0.57)		
Central Government				0.000103	
				(0.01)	
Previous Location					
Current City Only					-0.0277
					(-1.56)
Other Province Only					-0.0347
					(-1.61)
Current City & Other Province					-0.0248
					(-1.21)
Sample Mean of Dependent Variable	0.031	0.031	0.031	0.031	0.031
(S.D.)	(0.043)	(0.043)	(0.043)	(0.043)	(0.043)
# Observations	967	959	959	983	983

Notes: All regressions include city and year fixed effects. *t*-statistics in parentheses are computed using standard errors clustered at the city level.

TABLE 12. Heterogeneity in PSEC Variable: Manipulated Blue-Sky Days I

	(1)	(2)	(3)	(4)	(5)
PSEC	2.358	2.833	2.443	2.523	1.843
	(1.99)	(1.87)	(1.36)	(1.07)	(1.21)
Interacted with					
Demographic Characteristics					
Male non-Han	0.925				
	(0.24)				
Female Han	-1.362				
	(-0.99)				
Education					
College Entrance During 1971-77		1.120			
		(0.60)			
College Entrance in 1978		-2.275			
		(-1.30)			
STEM Major			-0.115		
			(-0.06)		
Experience					
Years in Current Post				0.110	
				(0.26)	
Years to Retirement				-0.0658	
				(-0.29)	
Previous Experience					
Enterprise					0.719
					(0.43)
# Observations	983	983	983	979	967

Notes: All regressions include city and year fixed effects. *t*-statistics in parentheses are computed using standard errors clustered at the city level.

TABLE 13. Heterogeneity in the PSEC Variable: Manipulated Blue-Sky Days II

	(1)	(2)	(3)	(4)	(5)
PSEC	3.559	3.102	2.488	2.402	4.503
	(2.35)	(2.49)	(1.26)	(1.82)	(1.97)
Interacted with					
Previous Experience					
Research	-4.101				
	(-1.74)				
County Party Secretary Only		-1.734			
		(-0.71)			
County Mayor Only		-14.24			
		(-4.34)			
Both County Party Secretary & Mayor		5.059			
		(1.06)			
City Party Secretary Only			4.233		
			(0.94)		
City Mayor Only			-2.108		
			(-1.05)		
Both City Party Secretary & Mayor			-0.850		
			(-0.42)		
Central Government				-0.0944	
				(-0.05)	
Previous Locations					
Current City Only					-2.149
					(-0.86)
Other Province Only					-5.461
					(-1.65)
Current City & Other Province					-1.728
					(-0.50)
# Observations	967	959	959	983	983

Notes: All regressions include city and year fixed effects. *t*-statistics in parentheses are computed using standard errors clustered at the city level.

TABLE 14. PSEC, Economic Growth and Manipulation

Panel A. Mean of Economic Growth Indicators

Party Secretary: $PSEC = 1$	Difference $(PSEC=1) - (PSEC=0)$	t-Stat
GDP	1,973.36	617.02	1.69
By Sector			
Primary	101.53	-1.33	-0.11
Secondary	903.62	212.06	1.45
Tertiary	950.02	395.54	1.76

Notes: Standard errors are clustered at the city-level.

Panel B. Within-Correlation between Proportion of
Manipulation and Economic Growth

Party Secretary:	$PSEC = 1$	$PSEC = 0$
GDP	0.11	-0.03
GDP by Sector		
Primary	-0.16	0.02
Secondary	0.09	-0.03
Tertiary	0.11	-0.03
# of Observations	262	713

Notes: To compute the above correlations we first remove city-specific and time-specific unobservables from both the proportion of manipulation and the economic variable in question. Specifically, for two variable $Z_{it}^1 = \alpha_i^1 + \lambda_t^1 + u_{it}^1$ and $Z_{it}^2 = \alpha_i^2 + \lambda_t^2 + u_{it}^2$, the above correlation is the correlation between u_{it}^1 and u_{it}^2.

TABLE 15. Correlation between Manipulation and Promotion for Elite and non-Elite Educated Party Secretaries

	I		II		III	
	$PSEC = 1$	$PSEC = 0$	$PSEC = 1$	$PSEC = 0$	$PSEC = 1$	$PSEC = 0$
Promoted to Higher Admin. Position	0.11	-0.05	0.11	-0.06	0.03	-0.06
Promoted to						
Province-level Party/Government	0.11	-0.01	0.11	-0.01	0.17	-0.03
Province-level NPC/CCPCC	0.03	-0.08	0.04	-0.08	0.01	-0.05
Chief Manager (Party Secretary) of Provincial Dept	0.15	-0.01	0.15	-0.01	0.13	-0.01
Central Government	0.09	0.08	0.09	0.08	0.00	0.06
Sample Size	256	676	256	676	256	676

Notes: To compute the above correlations (I), we first remove city-rank-specific unobservables from both proportion of manipulation and the promotion variable in question. Specifically, for two variable $Z_{it}^1 = \mu_r^1 + \epsilon_{it}^1$ and $Z_{it}^2 = \mu_r^2 + \epsilon_{it}^2$, the above correlation is the correlation between ϵ_{it}^1 and ϵ_{it}^2. The correlation (II) are computed after removing city-specific unobservables from both the proportion of manipulation and the promotion in question. Specifically, for two variable $Z_{it}^1 = \alpha_i^1 + \epsilon_{it}^1$ and $Z_{it}^2 = \alpha_i^2 + \epsilon_{it}^2$, the above correlation is the correlation between ϵ_{it}^1 and ϵ_{it}^2. The correlations (III) are correlations of residuals after removing city-specific and year-specific unobservables similar to Table 14.B.

TABLE A1. List of Cities in Our Data Set

1	Anshan	38	Jiujiang	75	Suzhou
2	Anyang	39	Kaifeng	76	Taian
3	Baoding	40	Kelamayi	77	Taiyuan
4	Baoji	41	Kunming	78	Tangshan
5	Baotou	42	Lanzhou	79	Tianjin
6	Beihai	43	Lasa	80	Tongchuan
7	Beijing	44	Lianyungang	81	Weifang
8	Benxi	45	Linfen	82	Weinan
9	Changchun	46	Liuzhou	83	Wenzhou
10	Changde	47	Luoyang	84	Wuhan
11	Changsha	48	Luzhou	85	Wuhu
12	Changzhi	49	Maanshan	86	Wulumuqi
13	Changzhou	50	Mianyang	87	Wuxi
14	Chengdou	51	Mudanjiang	88	Xiamen
15	Chifeng	52	Nanchang	89	Xian
16	Chongqing	53	Nanchong	90	Xiangtan
17	Dalian	54	Nanjing	91	Xianyang
18	Datong	55	Nanning	92	Xining
19	Deyang	56	Nantong	93	Xuzhou
20	Fushun	57	Ningbo	94	Yanan
21	Fuzhou	58	Panzhihua	95	Yangquan
22	Guangzhou	59	Pingdingshan	96	Yangzhou
23	Guilin	60	Qingdao	97	Yantai
24	Guiyang	61	Qinhuangdao	98	Yibin
25	Haerbin	62	Qiqihaer	99	Yichang
26	Haikou	63	Quanzhou	100	Yinchuan
27	Handan	64	Qujing	101	Yueyang
28	Hangzhou	65	Rizhao	102	Yuxi
29	Hefei	66	Sanmenxia	103	Zaozhuang
30	Huhehaote	67	Shanghai	104	Zhanjiang
31	Huzhou	68	Shantou	105	Zhengzhou
32	Jiaozuo	69	Shaoguan	106	Zhenjiang
33	Jilin	70	Shaoxing	107	Zhuhai
34	Jinan	71	Shenyang	108	Zhuzhou
35	Jinchang	72	Shenzhen	109	Zibo
36	Jining	73	Shijiazhuang	110	Zigong
37	Jinzhou	74	Shizuishan	111	Zunyi

TABLE A2. List of Variables Collected for Local Officials in the Raw Data Set

#	Variable	#	Variable
1	Province	29	Years Worked in This City
2	City	30	Highest degree/certificate
3	Administrative Ranking of the City	31	School Name
4	Year	32	Bachelor/Associate
5	Name	33	Campus Location (province)
6	Member of CPC Provincial Committee	34	Key Univ. (1st round)
7	Year/Month to Assume Duty	35	Key Univ. (2nd round)
8	Age when Assuming Duty	36	Year/Month of Entering College
9	Year/Month to Leave Office	37	Major in College
10	Year/Month to Leave Office	38	Graduate School Name
11	Birth of Date	39	Year/Month of Entering Graduate School
12	Male	40	Major in Graduate School
13	Province of Birth	41	Highest Degree/Certificate
14	City of Birth	42	Year/Month of Obtaining the Degree
15	County of Birth	43	Major
16	Ethnic Group	44	School/Institute
17	Year/Month of Joining the Party	45	Government Training Program
18	Year/Month of Starting Career	46	Year/Month of Starting Training
19	Been a Secretary in Party/Government Institutions	47	Party School Training
20	Been a Enterprise's Employee	48	Year/Month of Entering Party School
21	Been an Academic or Policy Researcher	49	Level of Training in Party School
22	Been a Party Secretary of City	50	Studied Abroad
23	Been a Mayor of City	51	Duration of Abroad Study
24	Been a Party Secretary of County	52	Worked in Functional Departments
25	Been a Mayor of County	53	Name of the Functional Departments
26	Years in Central Governmental Institutions	54	Worked in Communist League Central
27	Years Worked in Other Provinces	55	Actual Current Administrative Ranking
28	Years Worked in This Province		

Notes: For each party secretary and mayor for each city who tenure overlapped with 2001-2010, we collected all of the above variables in our raw data set, which we then use to construct the variables listed in Table 1.

TABLE A3. Comparison between Mayors by Elite College Degree

	Elite College	Elite − Other Difference	t-Stat
Demographic Characteristics			
Male Han	0.90	0.08	2.06
Female Han	0.01	-0.01	-0.74
Male non-Han	0.09	-0.07	-1.86
Education			
Full-Time			
Completed College	1.00	0.59	20.66
STEM Major	0.68	0.50	8.01
Entered College Between 1971-77	0.18	0.02	0.47
Entered College in 1978	0.30	0.11	1.92
Part-time			
College	0.30	-0.18	-3.05
Graduate Degree	0.25	0.08	1.60
Experience			
Years in Current Post	1.94	0.01	0.04
Years to Retirement	9.21	2.23	3.64
Current Post in Birth Province	0.59	0.00	0.08
Previous Experience			
Enterprise	0.49	0.04	0.60
Research	0.41	0.21	3.38
Administrator in Gov't or Party Organization	0.43	0.07	1.13
County Mayor	0.19	-0.12	-2.27
County Party Secretary	0.19	-0.17	-3.15
City Mayor	0.15	-0.03	-0.60
City Party Secretary	0.10	0.01	0.35
Central Government	0.20	0.07	1.55
Location of Previous Posts			
Current City	0.90	0.01	0.48
Current Province	1.00	0.00	1.41
Other Province	0.28	0.07	1.09
# Observations			330

Notes: t-statistics are computed using standard errors clustered at the city level.