Online Appendices

A Promotion and Corruption: A Formal Model

This section presents a formal model to illustrate the logic of promotion-incentivized corruption. I first compare subordinates' equilibrium corruption levels under different regimes: a non-promotion regime, a merit-based promotion regime, and a bribe-based promotion regime. The results show that the last regime has the highest level of corruption. I then discuss the circumstances under which a superior opt for the bribe-based regime instead of the merit-based one.

A Non-promotion Regime

I consider a benchmark model with two identical, risk-neutral subordinates working in low-level positions l. Subordinates report to a superior who is assumed away in this benchmark model. Denote subordinate i's (where $i = 1\ or\ 2$) innate ability θ. Without loss of generality, I assume θ equals the economic output of the precinct/bureau governed by this subordinate. Subordinate i's performance is: $y_i = \theta - c_i + \epsilon_i$, where c captures this subordinate's corruption level. Assume θ is sufficiently large so that the highest level of corruption c is always less than θ.

Let w denote wage payment. Without promotion, a subordinate's payoff from wage and corruption on job l is $u(w, c) = w + g(c)$, where the utility of corruption $g(\cdot)$ is twice continuously differentiable, strictly increasing and concave.

A subordinate's ability to extract corruption revenue is constrained by how likely he/she will be caught. Let $1 - \phi(c)$ be the probability of being caught, where $\phi(c) \in [0, 1]$, $\phi'(c) < 0$, and $\phi''(c) = 0$. This assumption means that the higher level of corruption this subordinate commits, the more likely she will be caught, and the probability of being caught increases with corruption at a constant rate.[1] For simplicity, I assume the subordinates keep all revenues if she is not caught,

[1] We can also assume that the probability of being caught increases with corruption at an increasing rate, and the results will become a little more complicated. The main results in this article hold for both decreasing rates and relatively small increasing rates.

and she loses the corrupt gain $g(c)$ only if she is caught.[2] The subordinate's objective function is therefore her expected utility function, which is $Eu(w,c) = w + g(c)\phi(c)$.

I assume away promotion in this benchmark model so that subordinates' performance does not matter in their utility maximization. Thus, subordinate i simply choose c_i that maximize the utility of corruption without being caught. That is

$$\max_{c_i \geq 0} \quad w + g(c_i)\phi(c_i), \tag{A.1}$$

The first-order condition is

$$g'(c_i^*)\phi(c_i^*) + g(c_i^*)\phi'(c_i^*) = 0, \tag{A.2}$$

Since subordinates are identical, let c_{np}^* denote $c_i^* = c_j^*$ that solves (A.2) as a symmetric solution. Thus, c_{np}^* is the optimal amount of corrupt gain in the non-promotion regime. Under this non-promotion regime, the superior gets nothing from subordinates.

A.1 Promotion Tournament without Bribery

I then consider a single period tournament model where the two subordinates compete for promotions based on their performance, following Lazear and Rosen (1981). For simplicity, I assume that subordinates' alternative choice of jobs generates zero utility. Thus, any subordinate should participate in the tournament as long as she gains a positive utility from it.

The government unit has two types of positions denoted by $j \in \{h, l\}$. The winner of the tournament is promoted to position h, and the loser stays on position l. Let w denote the wage payment in position l and R denote the additional income that a subordinate can obtain upon promoting to position h. The wage payment can be considered fixed by administrative ordinance, which is the same as the wage in the non-promotion regime. The additional income R indicates all

[2] I can also assume that if undetected the subordinate keeps all the gains, and if detected, she gets nothing. However, the analytic solutions with this assumption will be far too complicated algebraically in the following extended models and the properties of the model will remain similar.

revenues (legal or illegal) in position h, which include wage increment, benefits, political achievement, and/or corrupt gains in the high position. Following with previous setting, the payoff to a subordinate from earning wage and taking corrupt gain on position l is $u(w, c) = w + g(c)\phi(c)$. If the subordinate wins the tournament, her utility is then: $u(w, c) = w + E(R) + g(c)\phi(c)$.

The payoff to the superior in this tournament without bribery is $Q_{nb} = \alpha E(y_1 + y_2)$ for some constant $\alpha \in [0, 1]$. α indicates the superior's share from the performance of the subordinates, such as wages, bonuses, careers, and political achievements that come from subordinates' performance.

Given wage w and promotion income R, the corruption pair (c_1^*, c_2^*) maximize subordinate i's expected income, wage, net of the utility of corruption: c_i^* must solve

$$\max_{c_i \geq 0} \quad R \cdot Prob\{y_i(c_i) > y_j(c_j)\} + w + g(c_i)\phi(c_i^*), \tag{A.3}$$

where $y_i(c_i) = \theta - c_i + \epsilon_i$. The first-order condition for (A.3) is

$$-R \cdot \frac{\partial Prob\{y_i(c_i) > y_j(c_j^*)\}}{\partial c_i} = g'(c_i^*)\phi(c_i^*) + g(c_i^*)\phi'(c_i^*), \tag{A.4}$$

That is, subordinate i choose c_i such that the marginal utility of corruption conditional on not being caught equals the marginal loss from the corruption-reduced effort $\theta - c_i$, which is the product of additional income from winning the tournament, R, and the marginal increase in the probability of winning.

By Bayes' rule,

$$\begin{aligned} Prob\{y_i(c_i) > y_j(c_j^*)\} &= Prob\{\epsilon_i > \theta - c_j^* + \epsilon_j - \theta + c_i\} \\ &= \int_{\epsilon_j} Prob\{\epsilon_i > -c_j^* + \epsilon_j + c_i | \epsilon_j\} f(\epsilon_j) d\epsilon_j \\ &= \int_{\epsilon_j} [1 - F(-c_j^* + \epsilon_j + c_i)] f(\epsilon_j) d\epsilon_j \end{aligned}$$

so the first-order condition (4) becomes

$$R \cdot \int_{\epsilon_j} f(-c_j^* + \epsilon_j + c_i) f(\epsilon_j) d\epsilon_j = g'(c_i^*)\phi(c_i^*) + g(c_i^*)\phi'(c_i^*), \tag{A.5}$$

In a symmetric Nash equilibrium (i.e. $c_i^* = c_j^* = c^*$), we have

$$R \cdot \int_{\epsilon_j} f(\epsilon_j)^2 d\epsilon_j = g'(c_i^*)\phi(c_i^*) + g(c_i^*)\phi'(c_i^*), \tag{A.6}$$

Since $g(c)$ is increasing and concave, $g(c_i^*)$ is positive and increasing in c_i^*, while $g'(c_i^*)$ is positive and decreasing in c_i^*. In addition, $\phi(c_i^*)$ is positive and decreasing in c_i^*, while $\phi'(c_i^*)$ is a negative constant. Thus, the right hand side of the equation (A.6), $g'(c_i^*)\phi(c_i^*) + g(c_i^*)\phi'(c_i^*)$, decreases in c_i^*. This suggest that, as the income R for winning increase, the optimal corruption level c_i^* decreases. Since subordinates i and j has the same level of corruption. Denote $c_{nb}^* = c_i^* = c_j^*$ the solution to (A.6).

As approaching the limit, R decreases to zero such that the tournament model becomes the afore-mentioned non-promotion regime, and the optimal corruption level c_{np}^* will be the highest, which means:

$$c_{np}^* > c_{nb}^* \quad for\ R > 0, \tag{A.7}$$

Thus, promotions provide an incentive mechanism for curbing corruption. This model illustrates the performance-based promotion argument, by which yardstick competitions among officials reduce corruption and encourage effort.

PROPOSITION 1: *With a linear probability of getting away with corruption $\phi(c)$, performance-based promotion tournament discourages corruption compared with a non-promotion regime.*

Interestingly, *if the performance evaluation is very noisy (i.e. ϵ has a large variance), it is not worthwhile to make much effort $\theta - c$*, because the outcome of the tournament is likely to be determined by luck rather than effort. If ϵ is normally distributed with variance σ^2, for example, then

$$\int_{\epsilon_j} f(\epsilon_j)^2 d\epsilon_j = \frac{1}{2\sigma\sqrt{\pi}},$$

which decreases in σ, so c^*_{nb} indeed increases in σ.

Note that the superior's payoff is the share of the expected value of subordinates' total performance. Thus, given the optimal corruption level c^*_{nb}, the superior's payoff is $Q_{nb} = 2\alpha(\theta - c^*_{nb})$, which decreases in σ.

PROPOSITION 2: *Under the performance-based promotion tournament, subordinates' optimal level of corruption c^*_{nb} increases as the noise σ in performance observation increases. Accordingly, the superior's payoff Q_{nb} under this tournament decreases as the noise σ increases.*

Promotion Tournament with Bribery

In the previous tournament model, the superior's decision of promotion does not depend on bribes. If bribery is allowed in a tournament for promotion, it distorts promotion incentives. In this subsection, I consider a setup that the superior can choose between a performance tournament or a bribe tournament. If the superior chooses a performance tournament, the rest of the game will be exactly the same as the previous game in which subordinates compete in a performance tournament. If the superior chooses a bribe tournament, subordinates will then compete in a bribery tournament, in which the one who pays the highest bribe is promoted. The entire game tree is shown in figure A.1.

A Bribery Tournament

The bribery tournament is just a bidding race in a sealed-bid auction (a refundable contest). If the bribery tournament is presented, the subordinates choose their bribe offers $b_1,\ b_2$. The superior then determines which subordinate to report as the winner for promotion. The tournament provides no *effort incentive* for the subordinates. This is because the superior selection of the winner will

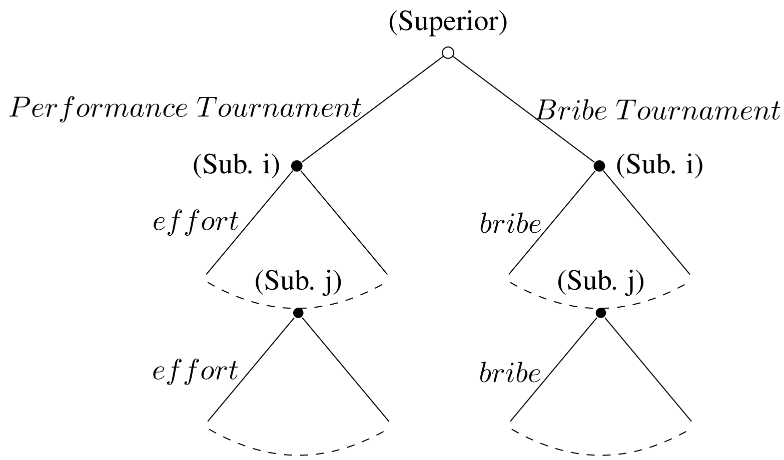

Figure A.1: Extensive Form of Tournament with Bribe Opportunity

be based entirely on the subordinates' bribing offers (see, e.g., Fairburn and Malcomson 2001).

Note that b is a subordinate's bribe to the superior, which is different from c – a subordinate's corruption revenues extracted from the economy. I assume that the superior demands bribes in advance. Thus, subordinates must pay their bribe before promotion. This means that subordinates must use their wage and corrupt gain obtained during the tournament to pay the bribe required for promotion in period 2. In reality, government officials' wages are negligible comparing to their corruption revenues. Thus, for a subordinate, I assume that she will always pay bribes out of her corruption income. The subordinate's objective function is, therefore, her expected utility function:

$$g(c_i - b_i) \cdot \phi(c_i) + w + Prob(b_i > b_j) \cdot R \tag{A.8}$$

In a sealed-bid auction, the submitted bids depend on bidders' true valuation of the winning prize. In this promotion tournament, benefits of promotion R is commonly known, and bidders (subordinates) are assumed identical in every aspect. Thus, they must pay an identical bribe to the superior. Assume upon receiving the bribe bids the superior randomly chooses one subordinate as the winner and refuses the loser's bribe payment (i.e. the tie-breaking rule). Thus, every subordinate has a $\frac{1}{2}$ chance to pay a bribe and get promoted. Assume for simplicity that the winning bid enough for promotion is easily affordable, that is, $c > b$. A Bertrand competition will drive promotion profit down to zero. Thus, the optimal bribe for promotion and the winning prize is $\frac{R}{2}$ for every subordinate. Assume that the probability of getting caught in bribe-taking is $1-p$. Thus, Under this bribery tournament, the superior receives $Q_b = p \cdot 2 \cdot \frac{R}{2} = pR$.

The solution to subordinate i's expected utility maximization problem is a c_i that maximizes her expected revenue function, or:

$$\max_{c_i \geq 0} \quad g(c_i - \frac{R}{2}) \cdot \phi(c_i) + w + \frac{R}{2} \tag{A.9}$$

The first-order condition for (A.11) is:

$$g'(c_i^* - \frac{R}{2}) \cdot \phi(c_i^*) + g(c_i^* - \frac{R}{2}) \cdot \phi'(c_i^*) = 0 \tag{A.10}$$

Denote c_b^*, $c_b^* = c_i^* = c_j^*$, the solution to (A.10). Comparing the optimal corruption level c_b^* in the bribery-promotion regime with the optimal corruption level c_{np}^* in the non-promotion regime, we must have $c_b^* > c_{np}^*$.

Proof:

From (A.10) and (A.2) we have:

$$g'(c_b^* - \frac{R}{2}) \cdot \phi(c_b^*) + g(c_b^* - \frac{R}{2}) \cdot \phi'(c_b^*) = 0 \tag{A.11}$$

$$g'(c_{np}^*) \cdot \phi(c_{np}^*) + g(c_{np}^*) \cdot \phi'(c_{np}^*) = 0 \tag{A.12}$$

Suppose $c_b^* \leq c_{np}^*$, then we have $c_b^* - \frac{R}{2} \leq c_{np}^*$. Since $\phi'(\cdot) < 0$, $\phi''(\cdot) = 0$, and $g'(\cdot) > 0$, $g''(\cdot) < 0$, we have: $\phi'(c_b^*) = \phi'(c_{np}^*) < 0$, $\phi(c_b^*) > \phi'(c_{np}^*) > 0$, $0 < g(c_b^* - \frac{R}{2}) < g(c_{np}^*)$, and $g'(c_b^* - \frac{R}{2}) > g'(c_{np}^*) > 0$. Thus, we have $g'(c_b^* - \frac{R}{2}) \cdot \phi(c_b^*) > g'(c_{np}^*) \cdot \phi(c_{np}^*)$ and $g(c_b^* - \frac{R}{2}) \cdot \phi'(c_b^*) > g(c_{np}^*) \cdot \phi'(c_{np}^*)$, which makes (A.11) and (A.12) a contradiction. Therefore, we must have $c_b^* > c_{np}^*$.

Q.E.D

PROPOSITION 3: *With a linear probability of not being caught $\phi(c)$, bribery-based promo-*

tion tournament encourage corruption comparied with a non-promotion regime.

The Superior's Options

I now work backward to the first stage of the game to find the superior's best response. Anticipating that she will receive $Q_b = pR$ in the bribery tournament and $Q_{nb} = 2\alpha(\theta - c^*_{nb})$ in the non-bribery tournament, if $Q_b > Q_{nb}$, the superior will choose to take bribe and let subordinates play the bribery tournament; if $Q_b < Q_{nb}$, the superior will opt for the performance tournament in which subordinates compete on performance for promotion.

An immediate result from the superior's trade-off is that, if $\alpha < \frac{pR}{2(\theta - c^*_{nb})}$, the superior will choose the bribery tournament in which promotions encourage lower-level corruption. This means, if the superior's stake in lower-level performance is sufficiently low, she will choose a corruption equilibrium.

PROPOSITION 4: *Holding other factors constant, for $\alpha > \bar{\alpha}$, the superior's stake in lower-level performance is sufficiently small so that she will choose the bribery tournament and get a payoff pR; for $\alpha \leq \bar{\alpha}$, the stake is large enough so that it is more profitable for the superior to choose the performance-based tournament and get a payoff $2\alpha[\theta - c^*_{nb}]$.*

The probability of being caught in bribe-taking $1 - p$ also affects the superior's payoff. If the probability is sufficiently small, or p is sufficiently large: $p \geq \frac{2\alpha(\theta - c^*_{nb})}{R}$, the superior will also choose the bribery tournament.

PROPOSITION 5: *Holding other factors constant, for $p \geq \bar{p}$, the probability of not being caught in bribe-taking is sufficiently high so that it is more profitable for the superior to choose the bribery-based tournament and get a payoff R; for $p < \bar{p}$, the probability is small enough so that the superior will choose the performance-based tournament and get a payoff $2\alpha[\theta - c^*_{nb}]$.*

In addition, as stated in Proposition 2, under the performance-based promotion tournament, c^*_{nb} increases as the noise σ in performance measures increases. Holding other factors constant, as the noise σ increases above a cutoff value $\bar{\sigma}$ so that $2\alpha(\theta - c^*_{nb}) < pR$, the superior will also choose to accept bribes and let subordinates play a bribery tournament.

PROPOSITION 6: *Holding other factors constant, for $\sigma \geq \bar{\sigma}$, the noise of performance observation is too large so that it is more profitable for the superior to choose the bribery-based tournament and get payoff R; for $\sigma < \bar{\sigma}$, the noise of performance observation is small so that the superior will choose the performance-based tournament and get a payoff $2\alpha(\theta - c^*_{nb})$.*

A.2 Discussion

The model specifies the circumstances that promotions encourage bureaucratic corruption. In particular, it shows that when mid-level officials' stake in lower-level performance is sufficiently low, noises in performance evaluation are sufficiently high, and/or punishment for wrong-doing is not serious, promotions will incentivize lower-level corruption.

An interesting finding is how the noise of performance evaluation influences the superior and subordinates' equilibrium strategies. If the noise is small enough, subordinates will make enough efforts so that the superior's share from subordinates' performance is greater than her bribe payoff from encouraging corruption/discouraging efforts, the superior will then let subordinates play the performance-based tournament. However, if the noise is sufficiently large, the superior will prefer the bribery-based tournament, under which promotions encourage bureaucratic corruption (Proposition 3).

The promotion income R has more nuanced effects on the superior's strategies. For example, as R increases, superior's payoff under the performance-based promotion regime increases due to decrease in subordinates' corruption level. However, superior's payoff under the bribe-based promotion regime also increases with R. Whether superior chooses performance-based promotion regime or corruption-based regime depends on the rate of payoff increasing on both sides.

For simplicity, I assume that the distribution function $\phi(c)$ – the probability of not being caught – decreases linearly in c. However, the results of the model hold even if we relax this assumption. For many kinds of distributions with a non-linear distribution function, the model will give the same results. In particular, the results certainly hold for $\phi''(c) \leq 0$, which means the probability of being caught increase with corruption level but the increasing rate becomes smaller as the subordinate becomes more corrupt. This assumption makes sense in reality. Usually, the more corrupt an official is, the more hesitate the government is to catch and punish her because she might have built a large corruption network with many other officials, politicians, and businesses. Taking her down might cause severe chain reactions that damage bureaucratic, political, and economic systems. Moreover, even if $\phi''(c) > 0$, the model results will still holds as long as $|\phi''(c)| < |g''(c)|$. In other words, as long as the increasing rate of subordinates' utility from corruption diminishes faster than the decreasing rate of not being caught given that corruption level, the main results will still hold.

B Empirical Appendices

B.1 Land Sales as a Corruption Measure

As discussed in the main text, the key measure of corruption is the area of land sold through negotiation in each prefecture. This subsection explains land sales in China.

In China, most of the undeveloped land has collective ownership – owned by peasant collectives in suburban or rural areas. Chinese land use laws do not allow selling collective-owned land on the market. Land with collective ownership needs to be confiscated by local governments and then "changed" into state-owned land before selling on the market. Usually, local governments take land from peasant collectives with little compensations relative to its market value (Ong 2014). Under this property right arrangement, the land virtually belongs to local governments. The current land administration regulations stipulate that land sale revenues should be collected and recorded as local budgetary revenue, which is very difficult for local officials to embezzle after transactions end. However, local officials have opportunities to solicit illegal payments during the transaction process.

Land transactions in China are well known for its dual land market (Xu, Yeh and Wu 2009): land sales by bidding, auction and quotation, and land sales through negotiation. Land sale through negotiation is a legacy of China's planned economy. Due to common ownership of communism, land ownership cannot be sold in China, and the government can only sell the right of land use. In the early days of China's economic reform, it was very difficult to estimate the market values of land use rights, so that local governments had to negotiate prices with land developers. Since then, land sale through negotiation became a convention and a major means of land transactions. There was far more land sold through negotiation than through bidding, auction, and quotation. Moreover, the prices of land sold through negotiation were much lower than the prices sold by the latter means. In 1995, the Central Government had to enact a rule to regulate the minimum rates for land sales through negotiation.[3]

In 2002, the Central Government further enacted a regulation to restrict the types of land for negotiation sales.[4] This regulation made selling commercial-use land through negotiation illegal. However, negotiation sales were still very common in China despite this regulation. In 2004, the Ministry of Land and Resource issued a decree to set August 31, 2004, as the deadline for all prefectures to ban negotiation for the transaction of commercial-use land.[5] Although the Central Government kept tightening its hand on land sales through negotiation, these regulations seemed unsuccessful, and negotiation is still widely practiced among local governments. For example, data from the Ministry of Land and Resource (2006) reveals that the area of land sold through negotiation constitutes of more than 70 percent of the total area in land transactions in 2003 and 2004, but revenues from this type of sales are less than 50 percent of total land revenues. In 2007, the Central Government had to further revise the rule for the transaction of commercial-use land to enhance land regulation.[6]

One may challenge the use of land sales as a corruption measure. The claim is that, if land sales through negotiation were corruption, the central government would have arrested officials who sold more land through negotiations. This claim does not hold for several reasons. First, arresting cor-

[3]Rules on the Determination of Minimum Prices for the Use Rights of State-owned Land Transferred Through Agreements (1995).

[4]Provisions on the Assignment of State-owned Construction Land Use Right through Bid Invitation, Auction, and Quotation (2002).

[5]Decree No. 71, Notice on Continuing the Review of the Implementation of the Grant of Land Use Rights for Commercial Uses by Soliciting Auction Bids or Listing on a Land Exchange.

[6]Provisions on the Assignment of State-owned Construction Land Use Right through Bid Invitation, Auction, and Quotation (2007 Revision).

rupt officials requires sound evidence or “the legal burden of proof”. Suspicious activities like land sales through negotiation is not enough to convict corruption crimes. Nevertheless, numerous cases of corruption charges based on wrongdoings in land sales suggest that the Chinese government indeed pays attention to land sale corruption. Second, scholars have long argued that punishment for wrongdoing in Chinese bureaucracy is not very serious (e.g., Manion 2004; Sun 2004). Thus, it is also possible that the Chinese central government tentatively allows certain extent of corruption in land sales as ”the grease of wheels” to ”reward” local officials for loyalty or political supports. Moreover, as my theoretical model suggests, under a corruption equilibrium, mid-level officials encourage lower-level officials to collect corruption revenues to bribe for promotions. If those mid-level officials are also responsible for monitoring lower-level officials’ corruption behavior – as they often are, they will certainly let lower-level officials get away with wrongdoing in land sales. For example, Chen and Kung (2018) find that provincial party secretaries who provided discounted land to firms linked to members of the CCP Politburo are more likely to be promoted to positions of national leadership.

B.2 Summary Statistics and Additional Corruption Measures

Table B.1 reports the summary statistics of the main data, including the averages of the prefecture characteristics and the corruption measure during each party secretary’s tenure.

Additional measures of corruption are aggregated using the firm-level survey responses from the World Bank’s Enterprise Survey (WBES) in 2005. Since the 2005 survey did not ask questions directly related to corruption, I use the following questions as proxies: 1) does your company have specialized staff to handle government relationships (for example, a government relation office)? 2) please indicate to what extent the following factors affect your company’s operation and growth: tax Administration; and 3) unstable economic and administration policies. These questions reflect the levels of obstacles in firms’ interactions with local government officials, which are reasonable proxies for local corruption, especially for those street-level officials who directly interact with firms.

Table B.1: Summary Statistics for Individual-level Data

Statistic	N	Mean	St. Dev.	Min	Max
Individual Level:					
Promotion	648	0.33	0.47	0	1
Age	648	49.57	3.60	38.08	58.33
Age Cutoff Dummy	648	0.72	0.45	0	1
Youth	648	0.51	0.97	0	5
Office	648	0.49	0.50	0	1
Edu. Level	648	3.76	0.77	2	6
Female	648	0.03	0.17	0	1
Minority	648	0.06	0.23	0	1
prefecture Level:					
log(Negotiation)	648	4.73	1.41	−2.12	8.46
log(Transaction)	648	5.97	1.04	2.02	8.62
Second Industry (percent)	648	50.77	12.46	12.54	89.75
Construction Land	648	7.52	8.27	0.00	65.98
log(Budget)	648	11.67	1.35	7.96	15.94
log(GDP per Capita)	648	9.93	0.72	7.66	12.55
log(Population)	648	4.47	0.70	2.65	6.66

The original WBES dataset includes 12,400 observations. The survey uses a uniform sampling methodology to generate a sample representative of the whole non-agricultural private economy. I aggregate the firm-level measures into the prefecture level, which generates 137 observations. These 137 prefectures are also a random sample that represents China's all 333 prefectures. I then match these corruption measures with the characteristics of prefectures and party secretaries. The unit of analysis is a prefecture governed by an individual party secretary. Due to missing data in prefecture and party secretary characteristics, the effective number of observations is 103. Table B.2 reports the summary statistics.

Table B.3 reports the correlation matrix among the four measures of corruption. We can see that the area of land sale through negotiation is positively correlated with all three WBES measures. As discussed in the main text, land sales capture higher-level officials' corruption (esp. local party secretaries). On the contrary, the WBES measures capture street-level officials' corruption because it is not leaders but street-level officials in local bureaus who collect taxes and administration fees from firms. This difference may explain why the correlations are small.

Table B.2: Summary Statistics for the 2005 World Bank Enterprise Survey Sample

Statistic	N	Mean	St. Dev.	Min	Max
Obstacle Adm.	103	0.91	0.33	0.05	1.68
Obstacle Tax.	103	0.74	0.29	0.04	1.52
Govt. Rlsp.	103	0.26	0.11	0.00	0.49
Promotion	103	0.51	0.50	0	1
log(Budget)	103	12.36	1.20	9.10	15.23
Second Industry (percent)	103	51.08	10.09	27.06	88.99
Youth	103	0.70	1.24	0	5
Office	103	0.52	0.50	0	1
Edu. Level	103	3.79	0.81	2	6
Female	103	0.01	0.10	0	1
Minority	103	0.05	0.22	0	1

Table B.3: Correlations among Corruption Measures

	Negotiation	Obstacle Tax	Obstacle Adm.	Govt. Rlsp.
Negotiation	1			
Obstacle Tax	0.0673	1		
Obstacle Adm.	0.0753	0.9	1	
Govt. Rlsp.	0.0594	0.5317	0.5376	1

B.3 Fuzzy RD Specification Tests

To verify whether the 51.5 cutoff age is a good treatment assignment device, I first present graphic evidence on the effect of age cut-off on promotions. Figure 2 in the main text plots the predicted probability of promotion using various control functions (linear, quadratic, and cubic). There are obvious discontinuities at the cutoff, with sharp drops in promotion probability for officials older than 51.5.

I conduct a McCrary sorting test using the optimal bandwidth of 6.52 based on Imbens' MSE method for bandwidth selection. The result is shown in Figure 1 in the main text. The p-value is 0.943, suggesting that there is no significant jump on the density function at the cutoff. These results further confirm that there is no statistically significant sorting of ages.

An important feature of RD design is that even when we have non-random selection into treatment (e.g. some cadres might be selected into the fast-path of promotion), we can identify impact estimates that share the same validity as those from a randomized experiment. Localized random treatment assignment can occur even in the presence of endogenous sorting, as long as agents do not have the ability to *sort precisely* around the threshold (Lee 2008; Lee and Lemieux 2010). If they could, the density of the age would be discontinuous. And this has testable implications, mainly that all pre-treatment characteristics should be indistinguishable around the age threshold.

Figure B.2 plots predicted values of individual characteristics using the same control functions as above. It shows that these characteristics – youth league experience, office experience, ethnicity, education level, and sex–are all similar between the treatments and controls. Although the cubic form of office experience has a little discrepancy at the cutoff on the fitted line, this is because the sample size is not enough to fit polynomial functions. Figure B.3 plots predicted values of city characteristics using the same control functions. The results are consistent with those of individual characteristics: the share of secondary industry, the share of construction land in the total area of the prefecture, government budget, GDP per capita and population are similar between the treatments and controls.

Table B.4 and B.5 examine whether individual and prefectural characteristics are indistinguishable for officials below and above 51.5 years old. As the coefficients of the age dummy suggest, there are no statistically significant differences between the two groups on all characteristics.

Table B.4: Individual Characteristics between Two Groups

VARIABLES	(1) Office	(2) Youth	(3) Edu	(4) Female	(5) Minority
agedummy	0.0217	-0.193	-0.0552	0.0259	0.0117
	(0.0642)	(0.120)	(0.0930)	(0.0216)	(0.0294)
age	0.00604	-0.0884***	-0.0811***	0.00201	-0.00294
	(0.00888)	(0.0163)	(0.0125)	(0.00299)	(0.00406)
Indv. Ctrls.	Yes	Yes	Yes	Yes	Yes
Pref. Ctrls.	Yes	Yes	Yes	Yes	Yes
Constant	-0.147	4.194***	6.975***	-0.282	0.119
	(0.603)	(1.119)	(0.828)	(0.203)	(0.275)
Observations	648	648	648	648	648
R-squared	0.022	0.091	0.129	0.026	0.051

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

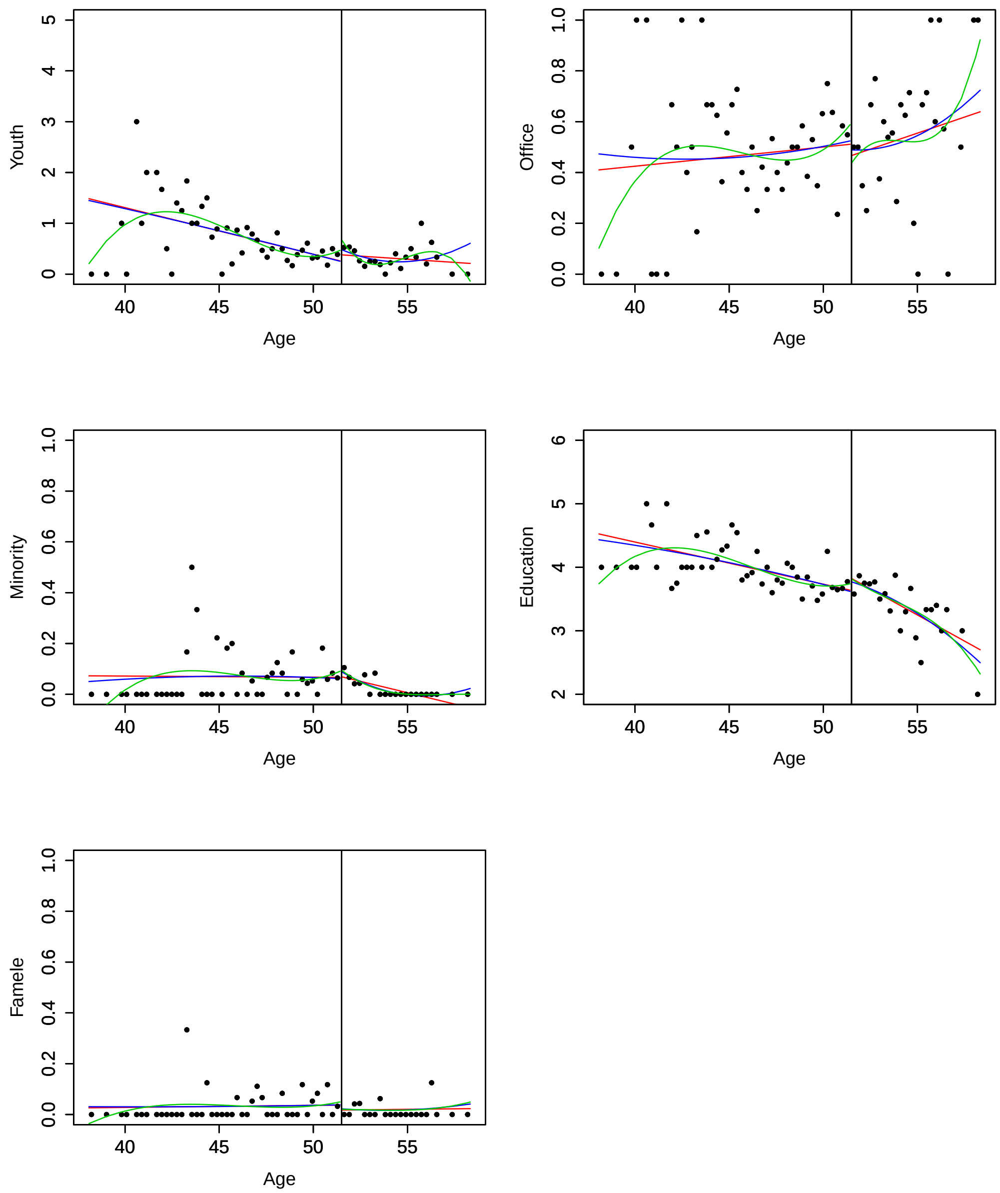

Figure B.2: Individual Characteristics at the 51.5 years old age threshold

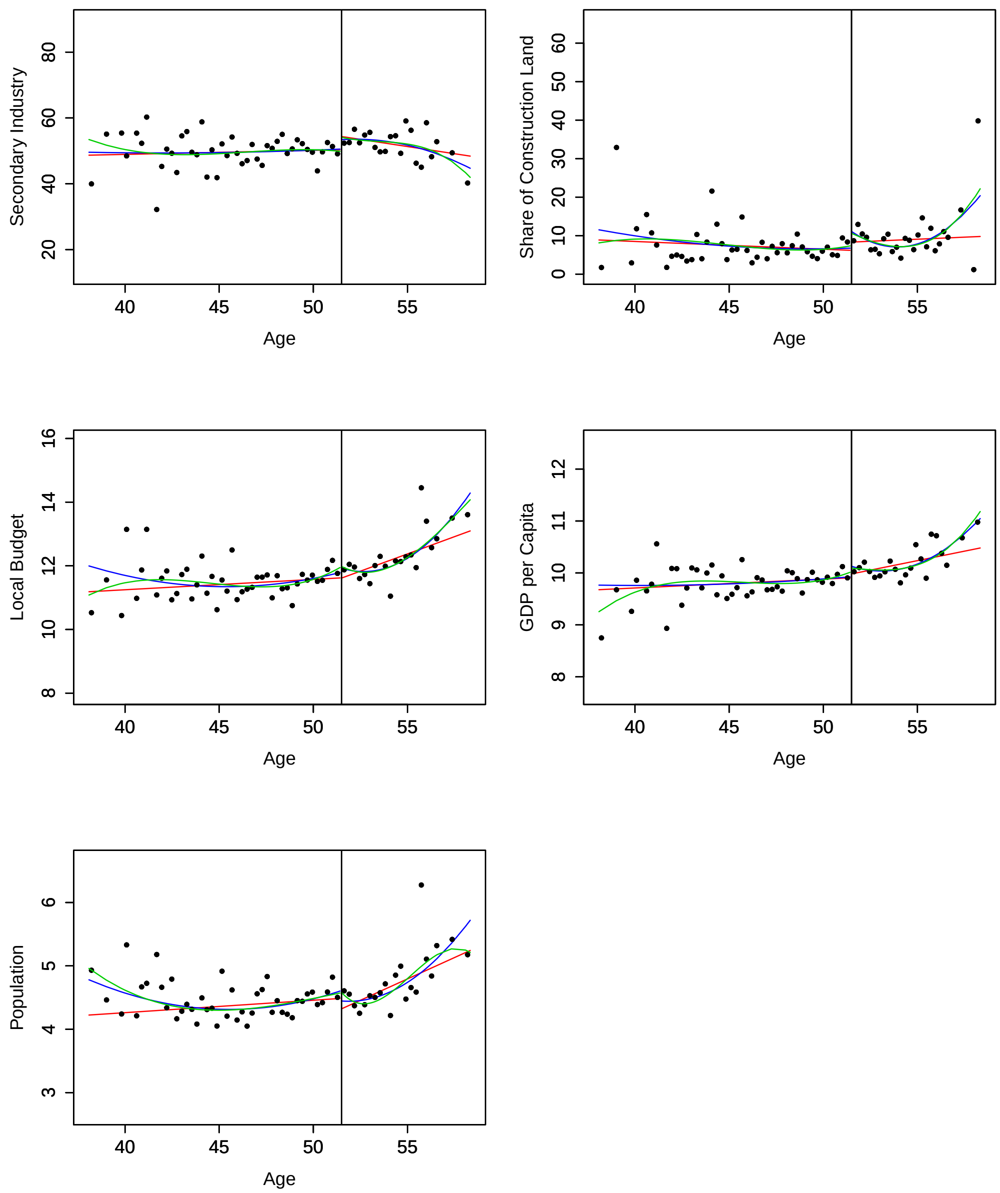

Figure B.3: Prefecture Characteristics at the 51.5 years old age threshold

Table B.5: Prefectural Characteristics between Two Groups

VARIABLES	(1) Secondary Industry	(2) Budget (log)	(3) GDPPC (log)	(4) Pop (Log)	(5) Construct Land
agedummy	-1.320	-0.0337	0.0151	0.0442	-1.682*
	(1.353)	(0.0552)	(0.0369)	(0.0471)	(0.958)
age	-0.196	-0.00386	0.0100**	0.0136**	-0.223*
	(0.187)	(0.00764)	(0.00509)	(0.00650)	(0.133)
Indv. Ctrls.	Yes	Yes	Yes	Yes	Yes
Pref. Ctrls.	Yes	Yes	Yes	Yes	Yes
Constant	-24.68*	-5.269***	4.550***	4.013***	-5.237
	(12.66)	(0.474)	(0.296)	(0.413)	(9.007)
Observations	648	648	648	648	648
R-squared	0.299	0.900	0.845	0.728	0.199

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

B.4 Fuzzy RD with additional controls

Table B.6 reports results of Fuzzy RD models with additional controls: (1) the total amount of the land sold on the market, and (2) the year that an official leaves the party secretary post. The former controls for the extent to which a local government wants to sell land for government revenue, and the latter controls for the general trend of land sold through negotiation over the years. Note that I did not include these two variables in the main model because the total amount of land transaction may also capture local officials' corruption behavior (Chen and Kung 2018), and including the year variable might be problematic because the models are fitted using average values of variables during a secretary's tenure (several years). Thus, I only use these two variables for robustness checks. As the results show, when controlling for year, the effect of promotion potential on corruption remains unchanged and is statistically significant. When controlling for total land sales, the impact reduces about one third and is significant at the 0.1 level. This result is not surprising since the total area of land sales is strongly correlated with land sales through negotiation, and the former also capture local corruption.

Table B.6: Promotion on Corruption: Year and Land Transaction Controls

	(1)	(2)	(3)
First Stage: Age Dummy on Promotion			
Age Cutoff Dummy	0.164***	0.169***	0.165***
	(0.0557)	(0.0557)	(0.0560)
*Year	-0.0235***		-0.0233***
	(0.00734)		(0.00735)
*log(Transaction)		-0.0148	-0.0105
		(0.0247)	(0.0248)
Age	-0.0181**	-0.0193**	-0.0180**
	(0.00870)	(0.00867)	(0.00874)
Indv. Ctrls.	Yes	Yes	Yes
City. Ctrls.	Yes	Yes	Yes
Constant	46.30***	-0.730	45.91***
	(14.66)	(0.545)	(14.69)
Second Stage: Promotion on Negotiation (Log)			
Promotion	2.249**	1.525*	1.333*
	(1.112)	(0.879)	(0.754)
*Year	-0.174***		-0.214***
	(0.0381)		(0.0257)
*log(Transaction)		0.982***	1.019***
		(0.0748)	(0.0689)
Age	0.0555	0.0197	0.0275
	(0.0423)	(0.0352)	(0.0280)
Indv. Ctrls.	Yes	Yes	Yes
City. Ctrls.	Yes	Yes	Yes
Constant	346.2***	0.00743	427.1***
	(76.55)	(1.153)	(51.55)
Observations	648	648	648
r2_2	-0.0590	0.343	0.517

Robust standard errors in parentheses, clustered on city
*** p<0.01, ** p<0.05, * p<0.1

B.5 Results from Polynomials

Table B.7 reports the results of Fuzzy RD models with higher-degree polynomials of the forcing variable – Age. Column (1), (2), and (3) fits models with linear, quadratic and cubic functional forms respectively. In addition, in Column (4), (5), and (6), I include control variables. Consistent with the linear model, quadratic and cubic models in Panel 1 show that an official under 51.5 years old will be 15.7 percent - 19.6 percent more likely to be promoted. This effect is statistically significant under all model specifications. The robust results further support using the 51.5 age cut-off as a randomization device. Panel 2 presents the results from the second stage estimations. An official with promotion potential will sell 3.5 to 10 times more amount of land area through negotiation, and the effects are statistically significant in most of the specifications.

These results suggest that promotion potential has a positive effect on bureaucratic corruption as measured by land transactions that involve great corruption opportunities. Note that the negative R-squared statistics are not a problem because R-squared has no meaning in two-stage least square models.

Table B.7: Promotion on Corruption: Polynomials

	(1)	(2)	(3)	(4)	(5)	(6)
	Linear	Quadratic	Cubic	Linear	Quadratic	Cubic
Panel 1: First Stage, Age Dummy on Promotion						
Age Dummy	0.157***	0.197***	0.196***	0.167***	0.153**	0.161**
	(0.0558)	(0.0621)	(0.0660)	(0.0555)	(0.0612)	(0.0651)
Age	-0.0198**	-0.155	-0.0557	-0.0194**	0.0261	-0.806
	(0.00807)	(0.112)	(1.427)	(0.00863)	(0.113)	(1.476)
Age Sq.		0.00142	-0.000623		-0.000479	0.0166
		(0.00117)	(0.0291)		(0.00116)	(0.0301)
Age Cub.			1.38e-05			-0.000116
			(0.000197)			(0.000203)
Indv. Ctrls.	No	No	No	Yes	Yes	Yes
Pref. Ctrls.	No	No	No	Yes	Yes	Yes
Constant	1.206***	4.396	2.784	-0.691	-1.764	11.64
	(0.430)	(2.676)	(23.17)	(0.539)	(2.747)	(23.96)
Panel 2: Second Stage, Promotion on Land Sold Through Negotiation (Log)						
Promotion	1.559	2.691**	2.709**	2.379**	2.732	2.845*
	(1.136)	(1.181)	(1.229)	(1.179)	(1.665)	(1.623)
Age	0.0617	-0.514	-0.820	0.0483	-0.139	-1.964
	(0.0439)	(0.438)	(5.422)	(0.0475)	(0.568)	(5.506)
Age Sq.		0.00625	0.0126		0.00204	0.0395
		(0.00446)	(0.112)		(0.00618)	(0.114)
Age Cub.			-4.30e-05			-0.000255
			(0.000760)			(0.000791)
Indv. Ctrls.	No	No	No	Yes	Yes	Yes
Pref. Ctrls.	No	No	No	Yes	Yes	Yes
Constant	1.168	13.88	18.80	-1.983	2.833	32.39
	(2.533)	(10.84)	(87.26)	(1.568)	(14.94)	(87.65)
Observations	689	689	689	648	648	648
r2_2	-0.0507	-0.395	-0.403	-0.197	-0.352	-0.405

Robust standard errors in parentheses, clustered on prefecture
*** p<0.01, ** p<0.05, * p<0.1

B.6 Results from the Local Linear Regression (Non-parametric)

I also use a non-parametric method of regression discontinuity for robustness check, following Skovron and Titiunik (2015). In particular, I estimate a local linear regression of the party secretary's promotion at $t + 1$ on the age at t, with weights computed by applying a kernel function on the distance of each observation's age to the cutoff age. These kernel-based estimators require bandwidth for implementation, with observations outside the bandwidth receiving zero weight. I follow common practice and select optimal bandwidth that minimizes mean-squared-error (MSE). The optimal bandwidth using Imbens' MSE method for bandwidth selection is 6.52 at each side of the cutoff age, which spans from 45 to 58 years old. Table B.4 reports the results from the Fuzzy Regression Discontinuity estimation using the 6.52 (year) optimal bandwidth. Based on this optimal bandwidth, the effective sample size reduces to 567, with 361 officials below the cutoff age, and 207 officials above the cutoff age.

Table B.8 shows that the first stage coefficient is -0.187 and is statistically significant. The magnitude is very close to the results from above parametric RD models. In the second stage, the coefficient is about 2.78, which is also similar to those from parametric models. The effect is statistically significant at a P-value of 0.05 level.

Table B.8: Results from Local Linear Regression

Optimal Bandwidth Restriction:

Cutoff c = 51.5	Left of Cutoff	Right of Cutoff
Number of obs	452	237
Eff. Number of obs	361	207
Order loc. poly. (p)	1	1
Order bias (q)	2	2
Bandwidth	6.525	6.525

Fuzzy RD Estimates:

		Coef.	Std.Err.	$P > \|z\|$	[95% Conf.	Interval]
First Stage:	DV: Promotion					
	IV: Age Cutoff	-0.192***	0.071	0.006	[-0.331,	-0.054]
Second Stage:	DV: Negotiation					
	IV: Promotion	2.779**	1.272	0.029	[0.286,	5.272]

B.7 Results from Additional Corruption Measures

I use alternative measures of corruption from the WBES dataset to further examine the relationship between promotion and corruption. Note that these measures mainly capture corruption conducted by street-level officials rather than prefecture leaders. In addition, the small sample size does not allow sophisticated causal identification strategies. Thus, the results from these measures should be interpreted with caution.

Table B.9 presents the results. Consistent with the results from the fuzzy RD specification, promotion is positively correlated with perceived obstacles from tax administration and obstacles from unstable economic and administration policies. And the results are statistically significant even if the sample size is only 103. Promotion is positively correlated with the Govt. Rlsp. variable – the percentage of firms that report having specialized staff to handle government relationships, but the relationship is not statistically significant. Perhaps this measure captures some firm features other than local corruption. For example, large firms, firms working closely with public sectors, and state-owned firms are more likely to have such specialized staffs.

In addition, the findings using street-level corruption measures may suggest a possible chain reaction of corruption on the promotion ladders: to bribe their way to promotion, local leaders solicit bribes from street-level officials, which incentivizes street-level corruption.

Table B.9: OLS Results, World Bank Enterprise Survey Corruption Measures

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Obstacle Tax.	Obstacle Tax.	Obstacle Adm.	Obstacle Adm.	Govt. Rlsp.	Govt. Rlsp.
Promotion	0.132**	0.137*	0.147**	0.140*	0.0206	0.0124
	(0.0539)	(0.0703)	(0.0605)	(0.0788)	(0.0200)	(0.0255)
log(Budget)		0.0374		0.0490		0.00754
		(0.0312)		(0.0346)		(0.0110)
Second Industry		-0.00551*		-0.00510		-0.000597
		(0.00311)		(0.00353)		(0.00101)
Youth		-0.0242		-0.00953		0.0138*
		(0.0230)		(0.0264)		(0.00789)
Office		-0.0349		-0.0858		-0.0224
		(0.0601)		(0.0684)		(0.0225)
Edu. Level		-0.0358		-0.0286		-0.0182
		(0.0363)		(0.0437)		(0.0144)
Female		-0.242**		-0.153		-0.0520
		(0.0989)		(0.110)		(0.0337)
Minority		0.0626		0.0250		0.0161
		(0.0733)		(0.113)		(0.0306)
Constant	0.680***	0.663*	0.839***	0.651	0.255***	0.262**
	(0.0353)	(0.357)	(0.0400)	(0.400)	(0.0156)	(0.131)
Observations	109	103	109	103	109	103
R-squared	0.053	0.136	0.052	0.125	0.010	0.086

Robust standard errors in parentheses
*** p¡0.01, ** p¡0.05, * p¡0.1

B.8 Promotion and Economic Development

A key insight from the merit-based promotion argument is that officials with promotion potentials will foster economic development in order to obtain promotions. Thus, promotion potentials will positively affect economic development. However, if the theory of promotion-incentivized corruption holds better for Chinese prefecture-level officials, we should observe that promotion incentives do not affect those officials' economic performance because their promotions are based more on bribes than on performances. The effect could even be negative since there might be an indirect effect that promotions increase corruption that, in turn, hurts economic development.

The fuzzy RD specification developed above can be easily adapted to test this alternative hypothesis. Table B.10 presents the 2SLS results based on five measures of economic growth at the prefecture level. From the first stage, we can see that being younger than 51.5 increases the chance of promotion by 17 percent, which is consistent with the above findings. For the second stage, I use GDP in log value as a measure for development in Column (1). As Wallace (2016) suggested, GDP figures might be ”man-made” and therefore unreliable, I then use electricity consumption (Column (2)), and industrial electricity consumption (Column (3)) as proxies for real GDP growth, the so-called “Keqiang index”, following Wallace (2016). The results from these measures suggest that the effect of promotion on economic development is negative though it is statistically insignificant. The non-positive findings further cast doubt on the applicability of the merit-based promotion argument on Chinese prefecture-level officials.

Table B.10: The Effects of Promotion on Economic Development

	(1)	(2)	(3)
VARIABLES	GDP	Power Use	Ind.Power Use
First Stage: Age Dummy on Promotion			
Age Cutoff	0.160***	0.160***	0.160***
	(0.0546)	(0.0546)	(0.0546)
Age	-0.0162*	-0.0162*	-0.0162*
	(0.00848)	(0.00848)	(0.00848)
log(Population)	0.190***	0.190***	0.190***
	(0.0284)	(0.0284)	(0.0284)
Indv. Ctrls.	Yes	Yes	Yes
Constant	-0.0916	-0.0916	-0.0916
	(0.477)	(0.477)	(0.477)
Second Stage: Promotion on Development			
Promotion	-0.917	-0.802	-0.610
	(0.623)	(0.725)	(0.886)
Age	0.0190	0.0204	0.0346
	(0.0233)	(0.0276)	(0.0331)
log(Population)	1.355***	1.167***	1.147***
	(0.139)	(0.161)	(0.188)
Indv. Ctrls.	Yes	Yes	Yes
Constant	-2.138**	5.691***	4.531***
	(0.857)	(0.972)	(1.198)
Observations	654	654	654
r2_2	0.428	0.298	0.275

Robust standard errors in parentheses, clustered on prefectures.
*** p<0.01, ** p<0.05, * p<0.1

References

Chen, Ting and James Kai-sing Kung. 2018. "Busting the "Princelings": The campaign against corruption in China's primary land market." *The Quarterly Journal of Economics* 134(1):185–226.

Fairburn, James A and James M Malcomson. 2001. "Performance, promotion, and the Peter Principle." *The Review of Economic Studies* 68(1):45–66.

Lazear, Edward P and Sherwin Rosen. 1981. "Rank Order Tournaments as Optimal Labour Contracts." *Journal of Political Economy* 89:841.

Manion, Melanie. 2004. *Corruption by design*. Harvard university press.

Ong, Lynette H. 2014. "State-led urbanization in China: Skyscrapers, land revenue and "concentrated villages"." *The China Quarterly* 217:162–179.

Skovron, Christopher and Rocío Titiunik. 2015. A Practical Guide to Regression Discontinuity Designs in Political Science. Technical report working paper, University of Michigan.

Sun, Yan. 2004. *Corruption and market in contemporary China*. Cornell University Press.

Wallace, Jeremy L. 2016. "Juking the stats? Authoritarian information problems in China." *British Journal of Political Science* 46(01):11–29.

Xu, Jiang, Anthony Yeh and Fulong Wu. 2009. "Land commodification: new land development and politics in China since the late 1990s." *International Journal of Urban and Regional Research* 33(4):890–913.