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ABSTRACT

We study the implementation of the One Child Policy to test whether the promotions of mayors were meritocratic. We model the incentive design of provincial governments that evaluate mayors using self-reported performance. We relate the desire to maximize output while promoting high-ability mayors to equilibrium incentives, and derive testable predictions. Our empirical comparative statics are consistent with meritocracy. We then evaluate the screening efficacy and test for misreporting using retrospective birth rates. We find that, while promotions were meritocratic, misreporting sapped the effectiveness of the meritocracy, contradicting the belief that meritocratic promotions enabled China's development despite lacking democratic accountability.

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"计划生育是天底下最难的一项任务!"

"Birth planning is the hardship number one under heaven!"

– A Chinese cadre (Scharping, 2003)

Meritocracy in the Chinese political system is often credited with contributing to China's notable economic success, which has been a long-standing puzzle due to the absence of democratic institutions.[1] This paper formally tests whether promotions of local Chinese officials responsible for implementing and enforcing the One Child Policy (OCP) were consistent with a meritocratic objective (*i.e.,* a desire to place high-ability people in leadership positions). In addition, we use population auditing surveys to study the extent to which mayor manipulation of performance metrics affected the efficacy of the promotion mechanism in selecting high-ability leaders.

We begin by developing a theory of equilibrium compensation and promotion of local Chinese officials that is inspired by our empirical setting.[2] The principal (the provincial government) decides how to compensate agents of heterogeneous, private ability (the mayors), in order to maximize an objective function which weighs both total output produced (fewer births, in compliance with the OCP) as well as the expected ability of the promoted mayor. A more meritocratic government is one which takes actions motivated more by promoting the highest-ability mayor than by maximizing total output produced.[3] The results relate the government's value of meritocracy to the equilibrium compensation mechanism. In particular, we show that, as the principal's relative weight on promoting the highest-ability mayor grows, the equilibrium compensation mechanism moves from a piece-rate to a tournament. We then derive sharp empirical predictions which show that, if the principal is sufficiently motivated to promote the mayor with highest ability, then higher output will be less predictive of promotion when (1) the noise in the output measure is greater, and (2) when promotions are more competitive. A key feature of the model is that output is imperfectly-verifiable and non-contractible; in our empirical setting, mayors self-report birth rates, and these self-reports are difficult to verify. Our theory predicts the behavior of mayors facing audit risk and characterizes the degree to which the promotion mechanism succeeds at selecting the highest-ability mayor. Treating incentives as *equilibrium* objects and understanding the objectives that determine them is essential to a complete understanding of meritocracy, its efficacy, and its role in governance.

We connect the theory to the data by testing the model's predictions using a unique dataset on the performance and promotion of mayors in China from 1985-2000. Our first set of results tests the prediction that, if the principal places sufficient weight on the screening motive, improved birth control performance in implementing the OCP will be predictive of promotion.[4] We find a positive

[1]Economists have studied determinants of cadre promotions, for example Maskin et al. (2000) and Li and Zhou (2005). Bell and Li (2012) provide an overview of meritocracy in the Chinese political system from the point of view of political science. However, recent evidence on corruption and data manipulation, for example Jia et al. (2015) and Fisman et al. (2015), suggests that meritocratic promotions might not be successful at selecting high-ability leaders.

[2]This builds on a related literature studying incentives in organizations and governance in developing economies, for example Banerjee et al. (2002) and Besley et al. (2012).

[3]This distinction captures the trade-off between maximizing today's output production, and maximizing future output production by selecting high-ability agents. Further, the principal may inherently value promoting the highest-ability agent (for example, because meritocracy is a cultural value).

[4]We measure mayors' performance in implementing the OCP by the gap between the centrally-set birth rate target and the birth rate they report achieving.

correlation between reported OCP performance and promotion, suggesting that mayors with better reported OCP performance are more likely to be promoted. For example, reducing the reported birth rate by 1 in 1,000 people increases the probability of promotion by 10% and is equivalent, in its effect on promotion, to a 7% increase in GDP.

Next, we test the model's comparative static predictions for the effects of different informational and competitive settings on a meritocratic promotion rule. First, we show that OCP performance is more predictive of promotion in provinces where OCP performance is a more informative signal of mayoral ability.[5] Second, we show that OCP performance is less predictive of promotion in provinces where promotions are more competitive. This is because it is more difficult for any given mayor to have the maximum output when the pool of competitors is larger—thus, any given increase in an individual mayor's effort leads to a smaller increase in her probability of promotion in more competitive regions.[6] These results provide further evidence that, beyond implementing the OCP, promotion incentives were intentionally used to screen for high-ability mayors. Our paper thus builds on the strong but small empirical contract literature using an unusual and interesting setting of analysis: promotions within provincial Chinese governments.

We explore the robustness of these results to a number of potential concerns. One potential concern is that mayors' unobserved political connections could bias the estimation and lead us to find a spurious positive effect (Shih et al. (2012), Jia et al. (2015)). We deal with this concern in three ways. First, we assuage concerns of individual-specific sources of political connections by using the panel structure of the data and including mayor fixed effects.[7] The promotion incentive for birth rate control is not diminished and remains economically and statistically significant. Second, we pursue an identification strategy to isolate variation in OCP performance that is exogenous from time-varying political connections. We use changes in birth rate targets set by the central government in five-year plans as an instrument for OCP performance. We provide evidence for the validity of this strategy by showing that new province targets are not set to favor particular mayors, and that mayors are not strategically promoted to help them avoid toughened birth rate targets. This identification strategy shows that plausibly exogenous changes in OCP performance have statistically and economically significant effects on the promotion of mayors. Third, our model provides predictions for the comparative statics on noise and competitiveness whenever promotion is based on an unobserved metric that is correlated with OCP performance. These predicted comparative statics are rejected by the data. We also explore the robustness of our results to other potential concerns, including measurement error and prefecture-level incentives.

Finally, we study whether the incentive system succeeds at identifying high-ability mayors. Since mayors are evaluated on the basis of self-reported data, mayors may misreport. Our theory makes two predictions on this front. First, when the probability of detecting misreports increases, mayoral

[5] This result is robust to using three measures of noisiness: the province-level variance in birth rates, the province-level variance in gross migration, and the average of both measures.

[6] We use the average tenure of provincial officials as a first measure of competitiveness. Intuitively, provinces with higher average tenure are more competitive, since this means slots for promotion open up less frequently for aspiring mayors. We also use the average promotion rate as a second measure of competitiveness as well as the average of both measures. The empirical comparative static result is robust to using these different measures.

[7] Our regressions also include prefecture fixed effects, year fixed effects, prefecture-year characteristics, and potential determinants of birth rate targets.

effort (and actual output) increases and misreporting decreases. We use population auditing surveys and employ two different measures of the prefecture's birth rate to analyze potential cheating behavior. The first measure is the reported birth rate and the second is the birth rate measured in census micro data. We find that mayors adjust their manipulation of birth rate data in response to these economic incentives by reporting higher birth rates in years when audits are conducted. Second, our model shows that the non-contractibility of OCP performance lessens the efficacy of the screening mechanism in selecting high-ability mayors: the expected ability of the promoted mayor is a combination of the expected ability under a random promotion scheme and a scheme where OCP performance is contractible. We find empirical support for this prediction: OCP performance from census birth rates is not predictive of promotion, suggesting that promoted mayors do not have higher ability than mayors who are not promoted. This finding corroborates the result that mayors are likely to be manipulating the data they report. Rather than attributing these results to corruption or to an aversion to meritocracy in the Chinese government, we argue that the imperfect verifiability of the birth rate forces the provincial government to use a promotion rule that is equivalent to weighting random promotions with positive probability, where this weight increases as the verifiability problem worsens. Overall, our results form a counterpoint to the argument that the success of the Chinese authoritarian government can be attributed to a successful system of meritocratic promotions (Bell and Li (2012)).

Our paper adds to the broad literature on the design of incentives in uncertain environments by taking theory to a unique dataset in an interesting Chinese setting.[8] While a rich literature in contract theory explores a spectrum of incentive structures when incentives must be based on noisy signals of effort or ability,[9] the body of empirical evidence testing these theoretical mechanisms is relatively small.[10] Whether screening mechanisms successfully select high-ability agents for promotion is still an open question. For example, recent studies find empirical evidence of incentive distortions, including teacher manipulation of test scores (Jacob and Levitt (2003)) and of student composition in test-taking pools (Cullen and Reback (2006)). However, these studies do not investigate the impact that this scope for manipulation has on the quality of teachers hired. Our paper provides evidence both that performance measures are manipulated, and that this actually weakens the efficacy of the screening mechanism in identifying high-ability individuals. This finding connects personnel and political economics to forensic economics, a literature which uncovers evidence of hidden behaviors and corruption, and which studies the role of audits in limiting corruption.[11]

In addition, this paper develops a unified framework for understanding the mechanisms and

[8]See Oyer and Schaefer (2011) for a review of incentives in personnel economics.

[9]These structures range from piece rates to tournaments, and the literature examines their consequences in a wide variety of environments, ranging from firms to governments. See Lazear and Rosen (1981), Baker et al. (1994), Holmstrom (1999), Rochet and Stole (2003), for example.

[10]See Baker et al. (1994), Chevalier and Ellison (1999), Prendergast (1999), Chiappori and Salanie (2000), Bertrand and Mullainathan (2001), Kane et al. (2002), Chay et al. (2005), Rockoff et al. (2012), for example.

[11]See Zitzewitz (2012) for a review of recent papers in forensic economics. For example, Fisman and Wei (2004) finds that the difference between shipments reported as exports to Hong Kong but not as imports to China is larger for products where the Chinese tariff is higher and smaller for products where the tariff is high on closely related products. Our paper provides new evidence on strategic misbehavior among Chinese mayors: mayors are less likely to underreport birth rate in audit years, when the cost of cheating is higher. Thus, our paper is also related to studies using audits to detect corruption, including Olken (2006), Ferraz and Finan (2008), Ferraz and Finan (2011), and Bobonis et al. (2013), among others.

screening capacity of promotion incentives in the Chinese government. An extant literature suggests that promotion incentives play an important role in explaining China's rapid economic growth despite its poor institutions (Maskin et al. (2000), Li and Zhou (2005), Landry (2008), and Xu (2011)). Recently, a few studies have argued that political connections are more important in promotion than performance, that they complement the role of performance, or that ties to localities and local elites may influence the policies of promoted officials (Shih et al. (2012), Jia et al. (2015), and Persson and Zhuravskaya (2015)). Furthermore, a growing literature finds evidence of data manipulation by local governments in reporting accidental deaths (Fisman et al. (2015)) and air pollution (Chen et al. (2012), Ghanem and Zhang (2014)). Our findings build on this literature by uncovering an additional mechanism for the persistence of the OCP—in addition to caring inherently about lowering the fertility rate, the meritocracy-minded government also believed that reported success at reducing the fertility rate was informative of mayors' ability. However, the effectiveness of promoting based on OCP at selecting high-ability mayors was severely dampened by mayor manipulation. To our knowledge, the role played by the OCP in screening for high-ability leaders has not been explored by other researchers. Our findings suggest that the OCP may be an unexpected and hitherto unexplored example of a classic principal-agent theory relating the noisiness of contractible performance measures with incentives and promotion. More broadly, this study sheds light on the competing roles played by encouraging production of output and extracting information in other important policies around the world.

Finally, our paper contributes to the literature on the consequences of the One Child Policy (see, *e.g.*, Qian (2009), Ebenstein (2010), Wei and Zhang (2011), Choukhmane et al. (2014)), and provides new evidence of China's local enforcement of the world's largest population control policy. The finding that mayors manipulate the reported birth rate data suggests that their implementation of the OCP is an important component in their performance evaluation. However, the effect of the promotion incentive on the enforcement of birth rate control in equilibrium may be minimal in the presence of mayor manipulation.

The rest of the paper is organized as follows. Section 1 describes institutional details of the OCP and its implementation. Section 2 develops a model of optimal compensation for mayors and discusses testable predictions. We describe our data in Section 3. Section 4 tests the theoretical predictions on the promotion rule and Section 5 provides evidence of data manipulation in response to audit risk and analyzes the efficacy of the promotion mechanism in selecting high-ability mayors. Section 6 concludes by discussing the role of manipulation in analyzing equilibrium promotion rules.

1 Institutional Details of the One Child Policy

In 1979, soon after China's Cultural Revolution and after a decade-long economic crisis, Deng Xiaoping expressed the fear that "without birth planning, economic growth will be consumed by population growth." Since then, all economic planning has therefore presupposed success in population control. At the national level, a specific target on population growth was set so that the total population would not exceed 1.2 billion in 2000. Chinese scientists working for the government further developed a projection that showed that, in order to achieve the population target, the optimal fertility level should be one child per woman (Scharping (2003)). This recommendation was incorporated into the family planning policy in the same year and the policy was thereafter known in the West as the One Child Policy (OCP).[12]

Under the OCP, a limit of one child per family was strictly enforced in urban areas, and second-child permits were issued for special exemptions in rural areas and for ethnic minorities. Some other exemptions were also granted, for example, to couples who were disabled or who lived in remote areas. Provinces with a tight policy restricted themselves to common norms for exemptions, while regions with a more relaxed policy may include other criteria. The national policy was relaxed in 1984 to allow rural couples to have a second child if their first-born was a girl.

1.1 Enforcement Mechanisms

A variety of birth control methods have been used to enforce the OCP. Sterilization and insertion of an intrauterine device (IUD) after the first or second birth were implemented on a large scale. Between 1979 and 1999, the percentage of women of reproductive age who underwent sterilization rose from 21% to 35% (Scharping (2003)). Meanwhile, induced abortions of unauthorized pregnancies have been used as a "remedial measure making up for contraceptive failures." For above-quota births, financial sanctions are the main instrument for enforcing the OCP. Depending on the location and time period, the birth of an extra child can cost a family 10%-25% of their annual income for 7-14 years. Other punishments widely used include denial of bonus payments, health and welfare benefits, denial of job promotions or even demotions in urban work units, as well as the confiscation of family farmland in rural areas.

Strong resistance and non-compliance at the grassroots level, especially in rural areas, made it very challenging to enforce the OCP. As documented by Scharping (2003), internal reports issued within the party in the 1980s and 1990s acknowledged that assaults on local birth-planning cadres were frequently provoked by coercive abortions, sterilizations, and the administration of penalties.

1.2 Mayoral Promotions and the OCP

The central government controls the appointment, evaluation, promotion, and demotion of subnational officials in China, and the career paths of these officials are determined by the performance of their jurisdictions (Xu (2011)). The central government directly controls the key positions at the province level and grants the provincial government the power to appoint key officials at the prefecture level. The provincial government stipulates a set of performance criteria for mayors. Economic growth, social stability, and enforcement of the One Child Policy are consistently among the highest priorities (Birney (2014)). In a published list of performance indicators of 104 prefectures in 2000, GDP per capita was used to evaluate economic growth and the birth rate was used to evaluate enforcement of the OCP (Landry (2008)).

A centrally-controlled planning system has monitored the local enforcement of the OCP since the 1980s. At the highest level, the State Planning Commission sets birth plan targets as part of five-

[12] The OCP was intended to end by 2000. Amendments have relaxed this policy for single children, and it was further relaxed to a universal two-child policy in 2015. However, birth planning remains a 基本国策 (i.e., "a fundamental national policy") of the government (http://news.sina.com.cn/c/2016-01-11/doc-ifxnkkuy7874744.shtml).

year plans, with the original goal of meeting the national population goal of 1.2 billion by the year 2000. Thus, the annual province-level targets for population and birth rate are set every five years. Only national and provincial targets are set; these targets are assigned to prefectures and further distributed to lower levels (Hardee-Cleaveland and Banister (1988)). Prefectures are responsible for local implementation and submit the population and birth data to provinces. Provinces then transmit these numbers to the central government.

Birth control performance is directly linked to cadre evaluation. Hardee-Cleaveland and Banister (1988) document the following:

> In Shaanxi in March 1987, the provincial party committee deputy secretary and acting governor "demanded that leaders at all levels should simultaneously grasp two kinds of production - economic production and reproduction - and take measures to do this work well and firmly. Otherwise, they are not qualified leaders."

1.3 Data Collection and (Mis)reporting by Chinese Mayors

Data for the evaluation of mayoral OCP performance are gathered by a birth planning commission (Scharping (2003)). The birth planning commission is in charge of workers in villages (rural), neighborhood committees (urban), and industrial enterprises (urban), who file cards on women of reproductive age, and keep track of their births. These data are sent to the prefecture, and the prefecture aggregates these local numbers and sends them to the province. Prefectures do random checks twice a year to verify these numbers, while the birth planning commission does random checks more frequently. These local workers have no direct incentive to deviate from their assigned task, since their incomes and careers do not explicitly depend on these numbers, in contrast with the mayor. The prefecture then aggregates these local numbers and sends a prefecture-level number to province. The data manipulation (misreporting) is most likely to occur through the mayor (either directly or indirectly), since her performance evaluation depends explicitly on this number.

In addition to the birth rate, the birth planning rate, which is the percentage of total births that are authorized, is also reported from lower level governments. In practice, lower level authorities often report very high birth planning rates of 98-99%, which are extremely unrealistic and unreliable. This is because it is much more difficult for the central government to verify whether a birth is authorized than whether a birth occurred. For this reason, the birth planning rate is not used in the evaluation of mayor performance (Scharping (2003)).

The leadership has been aware that, even for birth rate numbers, there are potential problems with data quality since the data are reported by officials whose evaluations depend on these data. Population census data are ideal as a systematic comparison with reported numbers, but are only conducted approximately every ten years (1982, 1990, and 2000).[13] A mini census for 0.1% of population was conducted in 1995. To further investigate the credibility of reported birth numbers, the State Birth-Planning Commission was charged with conducting national fertility surveys for 0.1% to 0.2% of the population in 1988, 1992, and 1997. These census and national fertility surveys

[13] Census data are collected independently by the City Bureau of Statistics (organized by the National Bureau of Statistics (NBS)). They survey every household to gather birth and population information. It is viewed as the best data on birth and population counts.

were organized at the province level, where they serve as the main instrument for data validation. As an example, the 1992 fertility survey uncovered an underreporting of 18% in reported birth rates. A particularly striking case of underreporting was found in Guangxi province and the leadership was forced to deliver a written self-criticism (Scharping (2003)).

Figure 1 displays an official document from Fujian province that links OCP performance to promotion outcomes and details guidelines for local officials with respect to the implementation of the OCP. The first highlighted section states that local officials are responsible for reporting accurate birth rates and other OCP statistics. The second highlighted section states that local officials should ensure the accuracy of the reported numbers and avoid underreporting, misreporting, faking, and failing to report birth rate statistics. Finally, the third highlighted section states that the province government is responsible for investigating violations of these guidelines. If these guidelines are violated, the responsible officials are denied positive credits in their annual evaluation and their records are sent to the personnel department of the province government.

2 A Tournament Model with Non-Contractible Output

This section describes the model, relates the optimal compensation scheme used by the principal to the objective function, and characterizes properties of the equilibrium promotion rule. The principal compensates agents of heterogeneous, unobserved ability who exert unobserved effort in order to maximize a weighted sum of total non-contractible output produced and the ability of the agent she promotes. The model generates empirically-testable predictions regarding the responsiveness of the equilibrium probability of promotion to actual and reported output that depend on the weight the principal places on the meritocratic objective. We first consider the case where the principal's objective is purely to maximize total output produced.[14] We then consider the case where the principal also cares about promoting the highest-ability mayor.[15] The model's predictions enable the econometrician to distinguish between these two cases by studying the responsiveness of the equilibrium probability of promotion to reported performance, as well as comparative statics across noisier and more competitive environments. Our final result characterizes the degree to which the imperfect verifiability of output affects the efficacy of promotion on birth rates as a screening mechanism for ability.

2.1 The Model

Individuals: Consider a risk-neutral principal and $N \in \{2, 3, 4, ...\}$ risk-neutral agents. Utility for all agents is described by $u(x) = x$ for $x \in \mathbb{R}$. In our setting, the principal is the provincial governor and the agents are the mayors competing for promotion.

The principal chooses how to compensate agents for the output, y_i, they produce, as well as which agent to promote to maximize a weighted sum of total output produced and the expected

[14] That is, the provincial governor sets incentives for the birth rate caring only about population control.

[15] Mayoral ability is private information. In this case, output has screening as well as production value.

ability, a_i, of the promoted mayor:[16]

$$\omega E\left[\sum_{i=1}^{N} y_i\right] + (1-\omega)E[a_i | i \text{ is promoted}]. \tag{1}$$

In our setting, output y_i is the birth rate achieved by mayor a_i.[17]

Output Production vs. Screening Priority: ω captures how much the principal values maximizing total output produced relative to promoting the highest-ability mayor. If $\omega = 1$, the principal focuses only on maximizing output. If $\omega = 0$, the principal focuses only on promoting the agent with the highest ability. ω is determined by the central government in our empirical setting and is held constant across regions.

Production: $y_i = e_i + \varepsilon_i$ is the output produced by agent a_i, where e_i is the unobservable/non-contractible effort exerted by agent i, and $\varepsilon_i \sim \exp(\lambda)$ is noise with mean $E(\varepsilon) = \frac{1}{\lambda}$, variance $V(\varepsilon) = \frac{1}{\lambda^2}$, and is iid across agents.[18]

Moral Hazard: The effort cost to agent a_i is $c(e_i) = \frac{1}{a_i}\exp(e_i)$ for effort level e_i, where a_i is the privately-known ability of agent i. These assumptions ensure that a given level of effort is less costly for higher-ability agents, that higher levels of effort are more costly for all agents, and that effort cost increases at an increasing rate.[19] Assume for notational convenience that $a_1 > a_2 > ... > a_N \geq 1$; an agent with a higher i index has lower ability. The principal and the agents know the distribution of abilities in the economy, including the set of abilities $\{a_1, ..., a_N\}$. However, the principal does not know which ability level "belongs" to which agent.

Lie Detection: The principal cannot directly contract on the true output produced by the mayors. The principal can only compensate based on mayors' self-reports $\hat{y}_i$.[20] The principal audits each mayor after they submit private output reports and detects that a mayor is lying with probability:

$$\Pr(a_i \text{ is caught} \mid a_i \text{ is lying}) = \begin{cases} p, & \frac{\hat{y}_i}{y_i} \leq \delta \\ 1, & \frac{\hat{y}_i}{y_i} > \delta \end{cases}, \tag{2}$$

where $\delta \geq 1$ and $p \in [0,1]$.[21] That is, if agent a_i exaggerates her actual output production too much (beyond δy_i), she will get caught for sure; but if she slightly over-reports, she will be caught with some intermediate probability p. The strength of the audit is described both by p and δ; stronger

[16]The distinction between output maximization and promotion of high-ability agents in the objective function can be motivated in a variety of ways. For example, a principal who only cares about output maximization in our model can be thought of as a principal focused on optimizing in the short-run (e.g., an impatient principal), while a principal who also cares about ability of the promoted agent can be thought of as patient and optimizing over the long-run, since she cares not only about maximizing output today, but about identifying the highest-ability workers so that output may be maximized more efficiently tomorrow. In addition, we think it is interesting to allow for an inherent value of meritocracy (which is a popular belief in the case of China).

[17]The principal prefers a lower birth rate, and agents must exert more effort to achieve a lower birth rate. "Higher y is better" is standard, but in the case where output is the birth rate b, we can define output $y \equiv \frac{1}{b}$.

[18]Assume that $\lambda \in (0,1)$, a parametric assumption for objects to be well-defined: this ensures that $V(\varepsilon) \in (1,\infty)$.

[19]Note the following standard properties of $c(e_i)$: $\frac{\partial c(e)}{\partial a} < 0$, $\frac{\partial c(e)}{\partial e} > 0$, and $\frac{\partial^2 c(e)}{\partial e^2} > 0$.

[20]See Appendix A.5 for the case where output is contractible.

[21]If output is the birth rate, so that $y = \frac{1}{b}$, then the agent reports $\frac{1}{\hat{b}_i}$, and is caught lying with probability 1 if $\frac{\frac{1}{\hat{b}_i}}{\frac{1}{b_i}} = \frac{b_i}{\hat{b}_i} > \delta$, that is, if $\hat{b}_i < \frac{1}{\delta} b_i$: the agent tries to report achieving a birth rate much lower than she actually achieved.

auditing is captured by a higher probability of catching lies (higher p) and by how much an agent can overreport before being caught with certainty (δ closer to 1). Both $\delta = 1$ and $p = 1$ capture the case where output is contractible. Mayors caught misreporting are fired and suffer disutility $F << 0$.[22]

Compensation: The principal chooses between two compensation schemes. The principal can promote an agent based on reported outputs in a *tournament* or the principal can pay a *piece rate*.[23]

Timing: The timing of the game is as follows:

1. Each mayor observes her own private ability a_i and chooses effort level e_i, which is non-observable and non-contractible by the principal.

2. Each mayor's output y_i is realized and is observed by each mayor. Output remains private information.

3. Each mayor submits a private report of output to the principal: $\hat{y}_i$.

4. The principal audits each mayor. If the mayor reported $\hat{y}_i = y_i$, she is truthful and will not be wrongfully charged with lying. If the mayor reports $\hat{y}_i > y_i$, the principal detects the manipulation with the probability described in Equation 2; mayors caught lying are fired.

5. The principal promotes one mayor based on any criterion of her choice, and compensates mayors who are not fired.[24]

Equilibria: There are three types of pure strategy equilibria:

1. "Pure lie": all the mayors misreport their output.

2. "Pure truth": all the mayors truthfully report their output.

3. "Partial truth": some mayors misreport and some mayors report truthfully.

We focus on the first equilibrium ("pure lie") as we find it most empirically relevant. We discuss the other two equilibria in Appendix A.6.

[22] Mayors are fired by assumption. In practice, the action taken may differ from firing. All that matters for our model is that mayors do not want to be caught lying (they are not directly rewarded by the principal); we call this being fired as a shorthand in our model.

[23] We think this is a valuable restriction on the contracting space for several reasons. First, it is straightforward to allow the principal to choose a scheme that has both piece-rate and tournament elements. If we allow this, we see that a scheme which has both piece-rate and tournament elements weakly dominates pure piece-rate and pure tournament. Our results survive this generalization. Second, this enables us to fit smoothly into the context of existing literature which historically pits piece-rates against tournaments. Finally, case studies suggest that these are the kinds of compensation schemes that were feasible in our setting (Scharping (2003)).

[24] Note that the principal is not allowed to promote zero mayors (although she is allowed to set a bonus of zero). This would be an extra incentive tool for the principal to induce effort. In addition to being realistic (when a slot opens up, some agent does get promoted to fill it), this also "works against us" in the sense that this makes the tournament a less potent tool. Since one of our key goals in constructing this model is to show that there exists an intuitive subset of the parameter space, specifically, a screening motive, for which the principal's equilibrium choice of compensation scheme is a tournament, showing that the principal chooses to use a weakened tournament when she cares about screening implies that a more flexible tournament would be even better.

2.2 Characteristics of the Equilibrium Promotion Rule

We show that if the principal sufficiently values meritocracy, then tournaments are preferable to piece-rates as a compensation mechanism. We then characterize the relationship between OCP performance and probability of promotion, as well as how this relationship varies with different degrees of competition between agents and across different degrees of noise in the performance metric. The last result characterizes the efficacy of the tournament in screening high-ability mayors in the presence of manipulated output reports.

The Optimal Compensation Scheme

We first characterize the compensation scheme set by the principal.

Proposition 1. *There exists an $\tilde{\omega} \in (0, 1)$ such that, if $\omega > \tilde{\omega}$, (the principal values output for production relatively more than for screening) the principal uses a piece-rate mechanism and, if $\omega < \tilde{\omega}$ (the principal values output for screening relatively more than for production), the tournament mechanism is optimal.*

Please see Appendix A.2 for a detailed proof.

The intuition behind this result is the following. When the principal's sole concern is output maximization, continuous incentive pressure is the cheapest way for the principal to induce any total effort level from all agents. If the principal wants to maximize total output, she prefers to induce agents of all ability levels to exert some effort, rather than to induce the highest-ability agent to exert lots of effort while everybody else exerts zero effort, since it becomes increasingly more expensive to induce effort from any single agent due to convex costs.

On the other hand, if the principal's objective is to use observed output to identify the highest-ability agent, then tournaments are preferred. Since agents with lesser ability have little chance of winning the tournament, they respond by reducing their effort, while higher-ability agents respond by increasing their effort. This generates "effort separation" across the heterogeneously-able individuals, which reduces total output produced but is exactly suited for using output to infer agents' abilities. When the principal sufficiently values promoting the highest-ability agent, the tournament mechanism becomes optimal as it induces bigger differences in effort exerted between agents, thereby increasing the expected ability of the promoted agent. However, the manipulability of output limits informativeness, as the principal can only contract on reported output and detects lies imperfectly.[25]

Figure 2 clearly illustrates the intuition. Agents are ordered by ascending ability along the x-axis. The chosen parameters are provided at the bottom of the figure. We solve for the piece-rate that the principal would use if she chose to use a piece-rate scheme, as well as the bonus that the principal would use if she chose to use a tournament, given these parameters. The blue bars indicate effort exerted under the piece-rate scheme, and the red bars indicate effort exerted under the tournament. Both the lower total effort and the "effort separation" generated by the tournament are evident.

[25] This result survives allowing the principal to choose a scheme which includes both piece-rate and tournament components. A scheme with both components always weakly dominates pure piece-rate and pure tournament; however, as $\omega \to 1$, the pure piece-rate again becomes optimal, and as $\omega \to 0$, the pure tournament again becomes optimal.

Equilibrium Properties of Promotion under a Production Objective ($\omega = 1$)

According to Proposition 1, when the principal's sole concern is output production, the principal compensates output (lower birth rate) with a piece-rate. Thus, conditional on agent ability, the promotion rule is independent of OCP performance.

Proposition 2. *If $\omega = 1$, agents are compensated with a piece-rate and, conditional on agents' abilities, increasing output does not increase mayor a_i's probability of promotion. This is true regardless of the noise (λ) and the competitiveness (N) of the environment.*

Proposition 2 guides the econometrician to compare promotion outcomes for agents with higher and lower reported output. However, the results of Proposition 2 no longer hold whenever this comparison is not conditional on a given agent's ability.

Corollary 1. *If $\omega = 1$ and the principal bases promotions on a dimension other than OCP performance that is positively correlated with ability, agents are compensated via a piece-rate and, unconditional on agents' abilities:*

(i) Increasing output increases mayor a_i's probability of promotion.

(ii) Increasing output has a larger effect (increase) on the probability of promotion in noisier environments (smaller λ).

(iii) Increasing output does not have a differential effect (increase) on the probability of promotion in more competitive environments (larger N).

The proofs of Proposition 2 and Corollary 1 are presented in Appendix A.3.

The intuition for (ii) is as follows. We know from Proposition 2 that the principal compensates agents with a piece-rate when $\omega = 1$. Given this, it can be shown that higher-ability agents exert differentially higher effort compared to lower-ability agents in noisier environments. This is because, in noisier environments, the principal sets a lower piece-rate (the slope of the wage in reported output is flatter). Lower-ability agents decrease their effort differentially more than higher-ability agents in response to this lower piece-rate, since effort is more costly for them. Since ability is positively correlated with the dimension on which promotion is based, it must be that the impact of having higher ability on the probability of promotion in noisier environments is larger. But we know that ability is also positively correlated with output. Hence, it must be that the observed impact of increasing output on probability of promotion in noisier environments is also larger. Corollary 1 is a powerful empirical tool as it guides the econometrician who may be concerned that she is unable to separate variation in agent output from variation in agent ability.

Equilibrium Properties of Promotion under Screening and Production Objectives ($\omega < 1$)

Proposition 3. *If $\omega < \tilde{\omega}$, agents are compensated with a bonus in a tournament where the agent with the highest reported output who is not caught lying is promoted. Further, in the equilibrium where all mayors misreport:*

(i) Increasing output increases mayor a_i's probability of promotion

(ii) Increasing output has a larger effect (increase) on the probability of promotion in less noisy environments (larger λ)

(iii) Increasing output has a smaller effect (increase) on the probability of promotion in more competitive environments (larger N)

We present a sketch of the proof to build intuition. The technical details of the proof of Proposition 3 are presented in Appendix A.4.

We know from Proposition 1 that the principal incentivizes the production of output y by awarding a bonus B to the agent with the highest self-reported output who is not caught lying in the audit. We now solve for the equilibrium effort of mayor a_i conditional on misreporting:[26]

$$\max_{e_i} B \Pr(\hat{y_i} > \hat{y_{-i}}) - \frac{1}{a_i}\exp(e_i).$$

Expected utility for agent a_i is approximated by (see Appendix A.1 for details):

$$\begin{aligned} EU_{i\ lies}^{-i\ lies} \simeq\ & pF + (1-p)\exp\left(-\lambda\left[\frac{1}{N-1}\sum_{j\neq i} e_j - e_i\right]\right) E(p,N)B \\ & +(1-p)p^{N-1}B - \frac{1}{a_i}\exp(e_i), \end{aligned} \qquad (3)$$

where $E(p,N)$ denotes the expected probability that a_i's error is weakly greater than the maximal order statistic for the error in the population of non-fired mayors:

$$\begin{aligned} E(p,N) \equiv\ & \left[(1-p)^{N-1}\exp(-\lambda\bar{\varepsilon}_{N-1}) + ... + (1-p)p^{N-2}\exp(-\lambda\bar{\varepsilon}_1)\right] \\ =\ & \left[(1-p)^{N-1}\exp\left(-\sum_{j=1}^{N-1}\frac{1}{j}\right) + ... + (1-p)p^{N-2}\exp(-1)\right]. \end{aligned}$$

Agent a_i's expected utility in Equation 3 breaks down in an intuitive way:

1. The first term captures the loss from being fired (F) when a_i gets caught lying, which happens with probability p.

2. The second term is the most complex; it captures the gain from promotion (B) in all the cases where a_i does not get caught but various subsets of the other $(N-1)$ lying mayors are caught. All possibilities ranging from "none of the other mayors is caught" to "all but one of the other mayors are caught" are addressed in this term.

   The key observation is that the average effort of the non-detected mayors is always $\frac{1}{N-1}\sum_{j\neq i} e_j$ regardless of how many of the other mayors are detected. This is due to the constant probability of detection.[27] The expected utility from these contingencies is simplified by factoring

[26] Note that if a mayor does choose to lie, her optimal lie is $\hat{y}_i = \delta y_i$. Although the structure of misreporting is the same across agents, the actual reports will be heterogeneous, since y_i is heterogeneous. The degree of inflation is independent of the individual but the level of the lie will vary by individual. Given that the mayor has chosen to misreport, the choice of effort does not depend on the firing disutility F.

[27] A simple example will illustrate. Suppose there are four mayors: a_1, a_2, a_3, a_4. Mayor a_1 calculates the average effort of the pool of non-fired mayors she will face, in the case that one of the other mayors is caught. This means that she might face $\{a_2, a_3\}$, or $\{a_2, a_4\}$, or $\{a_3, a_4\}$. But she faces each of these pools with equal probability. Thus, the average of the average effort in each of these pools is just $\frac{1}{3}a_2 + \frac{1}{3}a_3 + \frac{1}{3}a_4$—but that is just the average ability of the three other mayors.

$\exp\left(-\lambda\left[\frac{1}{N-1}\sum_{j\neq i} e_j - e_i\right]\right)$ in Equation 3.[28]

3. The third term addresses the case where mayor a_i is not caught, but all the other mayors are caught. In this case a_i is promoted for sure.

4. The fourth term is the cost of effort to a_i from exerting effort e_i.

The equilibrium effort of agent a_i is given by:

$$e_i(i\ lies, others\ lie) = \frac{(N-1)}{N(1-\lambda)-1}\log(a_i) - \frac{\lambda}{N(1-\lambda)-1}\sum_{j=1}^{N}\log(a_j) + \log[(1-p)B\lambda] + \log E(p,N). \quad (4)$$

The principal foresees the agents' choices and sets B to maximize Equation 1:

$$\max_B \omega\left[\sum_{j=1}^{N} e_i(i\ lies, others\ lie) + \frac{N}{\lambda}\right] + (1-\omega)E[a_i|i\ is\ promoted] - B,$$

where we substituted equilibrium effort from Equation 4. The principal's first-order condition describes the optimal bonus:

$$FOC_B : \omega\frac{N}{(1-p)B\lambda}(1-p)\lambda - 1 = 0,$$

leading to an optimal bonus of $B^* = \omega N$; which is increasing in both ω, the principal's relative valuation of output production, and N, the degree of competition between mayors vying for promotion.

We now describe conditions under which an "all lie" equilibrium can be sustained (see Appendix A.6 for technical details). An "all lie" equilibrium is sustained when $EU_{i\ lie}^{others\ lie} - EU_{i\ truth}^{others\ lie} > 0$ for every i. It can be shown that this difference is monotonic in a_i. Either the highest-ability agent is the first to prefer to tell the truth (this is the case when the probability of detection, p, is high, or the scope for lying, δ, is low), or the lowest-ability agent is the first to prefer to tell the truth. Thus, an "all lie" equilibrium is maintained when even the highest-ability agent prefers to lie, or when even the lowest-ability agent prefers to lie. Why might the highest-ability agent be the first to prefer to tell the truth? The highest-ability agent is the best at producing output, so she has the best shot at achieving the highest output even if she reports truthfully. When probability of detection is high, the highest-ability agent is the first for whom it is not worth the probability of getting caught and fired. When the scope for lying is low, the highest-ability agent has even more of a shot at having the highest output when she reports truthfully, since the other misreporting agents can't inflate their reports by much.

We now compare the probability that a_i is promoted when output is and is not contractible. The probability that a_i is promoted when output is not contractible and misreporting is therefore

[28] Recall that $\bar{\varepsilon}_k$ is the maximal order statistic for a sample of k iid draws from the error distribution $\exp(\lambda)$ and that $\bar{\varepsilon}_k = \left(1 + ... + \frac{1}{k}\right)\frac{1}{\lambda}$.

possible is given by:

$$\Pr(a_i \textit{ is promoted}) = \frac{a_i^{\frac{N-1}{N(1-\lambda)-1}-1}}{\left(\sum_{j=1}^{N} \log a_j\right)^{\frac{\lambda}{N(1-\lambda)-1}}} E(p, N) + p^{N-1}(1-p).$$

By way of comparison, in a model with contractible output with no possibility of lying, the probability that a_i is promoted is given by:[29]

$$\Pr(a_i \textit{ is promoted}, \textit{contractible}) = \frac{a_i^{\frac{\lambda}{(1-\lambda)}} \left[\exp\left(-\lambda \bar{\varepsilon}_{N-1}\right)\right]}{\left(\sum_{j=1}^{N} \log a_j\right)^{\frac{\lambda}{N(1-\lambda)}}}.$$

When output is not contractible, the probability of promotion has a term that does not depend on ability and captures the chance of not being caught: $p^{N-1}(1-p)$. In addition, the ability term has less weight than in the case of contractible output that is captured by the expected maximal order statistic. The lying mayor no longer competes against all other mayors since some of them will get caught. The main takeaway is that, when output is not contractible and we are in the "pure lie" cheating equilibrium, the probability that any mayor a_i is promoted depends less on her ability a_i and more on a randomly-drawn ability than in the "no cheating/output is contractible" scenario.

The comparative statics described in Proposition 3 follow from the equations characterizing equilibrium effort choice by mayors and the equilibrium compensation scheme set by the principal. Appendix A.4 contains technical details and derivations.

Screening when Output is Non-Contractible

Our final result characterizes the degree to which mayor manipulation decreases the screening ability of the compensation mechanism.

Proposition 4. *If $\omega < \tilde{\omega}$, so that the tournament compensation is optimal in the "all lie" equilibrium where all mayors misreport output:*

(i) The expected ability of the promoted mayor when output is not contractible is a weighted sum of the expected ability of the promoted mayor when output is contractible and there is no misreporting and the expected ability of a randomly-drawn mayor.

(ii) In tournaments with weaker audits (lower p), the expected ability of the promoted mayor is closer to a random draw.

(iii) In tournaments where audits are completely uninformative ($p = 0$), the expected ability of the promoted mayor when output is non-contractible is exactly the population average.

We observe this directly by comparing the expression for the expected ability of the promoted

[29] See Appendix A.5 for the derivation of this case.

mayor when output is contractible:

$$E^{contractible}[a_i|i \text{ is promoted}] = \frac{\sum_{j=1}^{N} a_j^{\frac{\lambda}{(1-\lambda)}} \exp\left(-\sum_{j=1}^{N-1} \frac{1}{j}\right)}{N\left(\sum_{j=1}^{N} \log(a_j)\right)^{\frac{\lambda}{N(1-\lambda)}}}$$

and the corresponding expression when output is not contractible but all mayors cheat:

$$E^{non-contractible}[a_i|i \text{ is promoted}] = \frac{\sum_{j=1}^{N} a_j^{\frac{N-1}{N(1-\lambda)-1}-1} E(p,N)}{N\left(\sum_{j=1}^{N} \log(a_j)\right)^{\frac{\lambda}{N(1-\lambda)-1}}} + Np^{N-1}(1-p)\frac{1}{N}\sum_{j=1}^{N} a_j.$$

In the non-contractible case, the expected ability of the promoted mayor includes an extra term not present in the contractible case: $Np^{N-1}(1-p)\frac{1}{N}\sum_{j=1}^{N} a_j$; this term is proportional to the population average and is the expected ability of mayors that are not caught cheating. The key difference in the screening efficacy of the tournament is that, in the case of non-contractible output, the mechanism places positive probability on promoting a random mayor that increases in the weakness of audits (low p). At $p = 0$, the expected ability is exactly the population average.

3 Measuring Promotion and OCP Performance

Our study focuses on the time period 1985-2000. This time period is ideal for studying the relationship between mayoral promotions and the implementation of the OCP, as the system that monitors and sets birth targets was built in the 1980s with the ultimate goal of containing population growth by year 2000.

Sample of Mayors

We collected Chinese mayoral data by digitizing a complete list of mayors in office from 1985-2000 from two series of hard copy records: *City Gazetteers,* published by the gazetteer office of each city, and the *City Development Yearbook,* published by the Chinese Urban Development Research Council. The list includes the mayor's name, as well as the year and month at the start and end of her term. We obtained data on 967 mayors in 258 prefectures and 28 provinces between 1985 and 2000. While data on Chinese political leaders at the provincial level are more commonly accessible, to our knowledge there are no such comprehensive data for Chinese mayors before 2000. Landry (2008) is the only other example we know of that uses mayor data in years 1990-2000.

Promotion

Promotion is defined as an upward move in the political career. The most natural upward move for a mayor is becoming the party secretary in the same or a different prefecture, which is the definition of mayor promotion in the existing literature (Landry, 2008).[30] This measure, though

[30] In Landry (2008), promotion is defined as being promoted to the party secretary in the same prefecture or elsewhere. This definition underestimates the likelihood of promotion because mayors could move to higher-ranked

convenient, ignores other possible moves above the prefecture level, including provincial governor or vice-governor, minister of central ministries, etc. A mayor is defined as being promoted if there is an increase in her bureaucratic rank to any of the following positions at the end of her term:

1. Prefecture: party secretary in the same or a different prefecture.

2. Province: provincial governor or vice-governor, party secretary or vice-secretary, party committee member, chairman or vice-chairman of the People's Political Consultative, chairman or vice-chairman of the People's Congress.[31]

3. Central: minister or vice-minister of central ministries.

A mayor is not promoted if she continues as mayor, moves to positions of the same bureaucratic rank, or exits politics. First, one could continue as mayor in the same or a different prefecture. In our data, forty mayors served in two prefectures. If one is transferred from the first city to the second, she is not promoted in the first city and her promotion status in the second city depends on her move after serving the second time. Second, one could be promoted to positions in the provincial government that have the same bureaucratic rank as mayor: director or vice-director of provincial departments, assistant to the provincial governor, etc. Finally, while one could leave politics by working in industry, we only observe this for three mayors in our data. See Appendix B for details on the measurement of promotion in the data.

OCP Performance

We digitized birth rate targets from *Provincial Five-year Plans* in 1985, 1990, and 1995. Targets for policy outcomes are set every five years. For example, a province's 1985 plan sets the target for annual birth rate in 1986-1990.

We use two measures of the birth rate to compare the reported OCP performance with actual performance: 1) the official birth rate from published data that are reported to provincial governments, and recorded in *City Statistical Yearbooks*, and 2) a retrospective birth rate from micro-data of 1990 and 2000 population censuses that are not observed by the provincial government on a yearly basis. A mayor's reported OCP performance is measured by comparing the reported birth rate with the target from the corresponding five-year plan. The lower the reported birth rate relative to the target, the better the mayor's OCP performance.[32] Unfortunately, not all prefectures publish data on birth rates consistently in 1985-2000. On average, 80% of prefectures report birth rate data,

positions at the province or central level. We use the most complete definition of promotion based on the bureaucratic rank. In Table 1, we show that 15% of promotion of mayors in 1985-2000 was above the prefecture level.

[31] An alternative is to define promotion to province-level positions based on administrative division, i.e., province is a higher administrative division than prefecture. However, this is more controversial than the definition based on bureaucratic rank. In our definition, if a mayor becomes the director of a department in the provincial government that has the same bureaucratic rank as mayor, she is not defined as being promoted.

[32] To the best of our knowledge, prefectures face a common province-level target. Our main specification controls for potential determinants of targets at the prefecture-level, including the percentage of childbearing-age women, the percentage of Han population, and the percentage of rural population. In addition, in Section 4.4.2, we estimate the effects of these determinants on province-level targets and use prefecture-level variation to compute prefecture-level targets. Our results are robust in these specifications.

except in 1988, when no prefectures published birth rate data.[33] In our sample of mayors, 697 out of 967 are matched with the official birth rate data.

We measure actual OCP performance by the gap between the birth rate target and the birth rate from census data. Census data are collected independently by the City Bureau of Statistics (organized by the National Bureau of Statistics (NBS)). They survey every household to gather birth and population information.[34]

We compute the birth rate retrospectively using micro-data from the 1990 and 2000 censuses; these data are observed by provincial government only in census years. Birth rates in 1986-1989 come from the 1990 census and those in 1990-2000 come from the 2000 census. The main concern regarding the use of census data is the potential for internal migration, since prefecture of birth is not observed for migrants. Migration was tightly restricted under the *Hukou* system until its relaxation in the 1990s. Figure A.1 shows the percentage of migrants in 1982-2000 from census and population surveys. The migration rate remained under 2% in the 1980s and slowly increased to 4% in 1995. The most significant increase was between 1995 and 2000, and the migration ratio reached 11% in 2000. We use the best available information on migration in the census to account for migration in measuring actual birth rate. We discuss how we measure birth rate from census data and account for migration in Appendix B.

Summary Statistics

Our main analysis sample includes 697 mayors in 211 prefectures and 28 provinces.[35] The number of prefectures in a province varies from 1 to 21.[36] Table 1 reports the summary statistics at both the mayor level and mayor-year level. 53% of mayors were promoted to a higher-ranked position, with 45% promoted to party secretary in the same or a different prefecture, 6% to leadership at the province level, and 2% to central ministries. Among all promotions, 15% moved above the prefecture level, suggesting a substantial underestimation of mayor promotion by the definition in previous studies. On average, mayors spent 3.8 years in office. Figure 3a shows the distribution of years in office. Most mayors were in office from two to five years. The turnover rates are especially high in the second and third years. Tenure at promotion has similar properties and is graphed in Figure 3b.

A key variable of interest is OCP performance, which is measured by the gap between the birth

[33] Column 2 of Table A.1 summarizes the number of prefectures that report birth rate data by year in our analysis sample.

[34] The NBS organizes a quality control survey after each census to check for unreported people (for example, hidden children). The survey sample for the 1990 census is around 170,000 people. The NBS finds 1 unreported birth per 1,000 births. It is viewed as the best data on birth and population counts. An interesting set of papers evaluates the quality of the 1990 census data. There is no consensus about underreporting in the census: Banister (1992) and Johansson and Nygren (1991) argue that there is no underreporting, while Zeng et al. (1993) argues the opposite. The latter paper backs out "actual births" by counting children in the mid-1990s and accounting for deaths.They find that births of female children are underreported in the 1990 census. We do not think this is a problem for our results, since we find that mayors underreport even relative to a potentially underreported census, our estimates are a weak lower bound on cheating. We also find that the extent of cheating decreases in audit years. This result would be overturned by an underreported census only if the census is particularly underreported in audit years, which seems very unlikely. Finally, we find that promoted mayors do no better in the census than unpromoted mayors. This would be overturned by an unreported census only if the census over-reported births especially for promoted mayors.

[35] Column 1 of Table A.1 summarizes the number of mayors by year in our analysis sample.

[36] Figure A.2 plots the histogram of the number of cities per province.

rate target and a given measure of birth rate. The average reported birth rate is 7.7 per 1,000 population, while the birth rate computed using census data is 8.3. Both are lower than the target average of 10.6. On average, the reported birth rates are 3 births per 1,000 people below target. 80% of mayors reported birth rates lower than their assigned target. In comparison, birth rates from census data suggest that only 74% of mayors were below their specified target. Figure 4 plots the empirical cumulative distribution functions of the two OCP performance measures and shows that misreporting occurs at most points in the distribution of outcomes. In our analysis, we use changes in targets as instruments for OCP performance. Figure 5 presents (a) the average birth rate target across provinces, as well as (b) the number of provinces that experienced a decrease in the target in each of the five-year plans.

Data on annual nominal GDP at the prefecture level in 1985-2000 come from *City Statistical Yearbooks.* We use the nominal GDP and national current price index (CPI) to compute real GDP. The average real GDP in the mayor-year sample is 9348 million RMB. Finally, we compiled prefecture-year controls from *City Statistical Yearbooks,* including population, percentage of urban population, and government investment.

4 Inferring the Principal's Objective from the Promotion Rule

We connect the theory to the data by testing empirical predictions from our model in Section 2. The first set of predictions focuses on the effect of reported OCP performance on the promotion of mayors, and characterizes comparative statics of this effect across regions with different noisiness of the output measure and different levels of competitiveness. Section 5 analyzes additional predictions on the screening ability of the tournament model as well as the manipulation behavior of mayors.

4.1 Empirical Implementation of Model Predictions

The first prediction from the model suggests that comparing promotion outcomes across mayors with different levels of OCP performance will allow us to infer whether the principal's objective has a significant meritocratic motive.

Prediction 1: *If the principal only cares about maximizing output production ($\omega = 1$), then we should observe that increasing output (OCP performance) does not affect the probability of promotion.*

Our first specification tests this prediction and examines whether better reported OCP performance increases a mayor's probability of promotion using a linear probability model:

$$Promoted_{icpt} = \beta_1 OCP^{reported}_{cpt} + X_{icpt}\gamma + \mu_i + \eta_{cp} + \lambda_t + \varepsilon_{icpt}, \tag{5}$$

where i denotes the mayor, c the prefecture, p the province, and t the year. The dependent variable, $Promoted_{icpt}$, is a binary outcome that is equal to 1 if mayor i in prefecture c of province p is promoted in year t and 0 otherwise. The key regressor of interest is reported OCP performance, measured as $OCP^{reported}_{cpt} = Target_{pt} - BirthRate^{reported}_{cpt}$. Superior performance in implementing the OCP, measured by $OCP^{reported}_{cpt}$, corresponds to a lower reported birth rate compared to the target. X_{icpt} is a vector of time-varying attributes of mayor i or prefecture c in year t, including the mayor's tenure, and prefecture-year log of real GDP, log of population, percentage of urban population, log of investment, and migration controls. Mayor fixed effects, μ_i, account for all time-invariant characteristics of the mayor i. Year fixed effects, λ_t, control for all national changes over time. Finally, we control for prefecture fixed effects, η_{cp}, as some mayors served two different prefectures. We allow for errors to be correlated at the province-year level.

The identifying assumption of Equation 5 is that OCP performance is uncorrelated to other factors that may drive mayor promotion. However, if the principal promotes mayors on an alternative metric that is positively correlated with OCP performance but unobserved to the econometrician, one could erroneously conclude that the province follows a meritocratic promotion rule. We address this concern in three ways. First, the panel nature of our data allows us to include mayor fixed effects, μ_i, which control for time-invariant ability that may affect the initial placement or political connections to province-level officials. Second, in Section 4.4 we use an instrumental variables approach that elicits variation in OCP performance using changes in targets from five-year plans. This strategy exploits variation in reported OCP performance that is uncorrelated with either changes in connections or other changes in unobserved margins.[37] As a third strategy, we use predictions from our model that characterize the comparative statics of OCP performance across provinces with different noisiness and competitiveness whenever promotions are based on unobserved characteristics that are positively correlated with OCP performance.

Prediction 2: *Unconditional on unobserved margins on which a mayor gets promoted, if the principal only cares about maximizing output production ($\omega = 1$), then we should observe:*

1. *Increasing output (OCP performance) increases the probability of promotion.*

2. *Increasing output (OCP performance) has a larger positive impact on a_i's probability of promotion in noisier environments (larger λ).*

3. *Increasing output (OCP performance) does not have a differential impact on a_i's probability of promotion in more vs. less competitive environments.*

Thus, by comparing the effect of OCP performance on promotion outcomes across provinces with different levels of competition and noise in the output variable, we can test whether a positive effect of OCP performance on promotion is due to unobserved characteristics or to a meritocratic objective. Moreover, Prediction 3 shows that these comparative statics are empirically distinguishable from the case of a meritocratic promotion rule.

Prediction 3: *If the principal cares about meritocracy, that is, promoting the highest-ability agent, in addition to increasing output production ($\omega < \tilde{\omega}$), then we should observe:*

1. *Increasing output (OCP performance) increases the probability of promotion.*

2. *Increasing output (OCP performance) has a smaller positive impact on a_i's probability of promotion in noisier environments (larger λ).*

3. *Increasing output (OCP performance) has a smaller positive impact on a_i's probability of promotion in more competitive environments (larger N).*

[37] In particular, this strategy assuages concerns that time-varying political connections (as in Jia (2014)) confound the effect of OCP performance on promotion.

We test these additional predictions by augmenting the linear probability model in Equation 5 to allow for the effect of OCP performance on promotion to differ by province-level measures of noisiness and competitiveness:

$$\begin{aligned} Promoted_{icpt} &= \beta_1 OCP^{reported}_{cpt} + \beta_2 OCP^{reported}_{cpt} * Noise_p + X_{icpt}\gamma + \mu_i + \eta_{cp} + \lambda_t + \varepsilon_{icpt} \quad (6) \\ Promoted_{icpt} &= \beta_1 OCP^{reported}_{cpt} + \beta_3 OCP^{reported}_{cpt} * Comp_p + X_{icpt}\gamma + \mu_i + \eta_{cp} + \lambda_t + \varepsilon_{icpt}. \quad (7) \end{aligned}$$

Equations 5-7 directly correspond to empirical Predictions 1-3. Prediction 1 suggests that $\beta_1 = 0$; Prediction 2 suggests that $\beta_1 > 0$, $\beta_2 > 0$, and $\beta_3 = 0$; and Prediction 3 suggests that $\beta_1 > 0$, $\beta_2 < 0$, and $\beta_3 < 0$.

We use two measures of the noisiness of OCP performance as a signal of effort and ability. The first measure is the standard deviation of gross migration (in-migration and out-migration), and the second one is the standard deviation of birth rates by province in the census data. Intuitively, a province with more gross migration or a province with a more variable birth rate will make it harder for a province-level official to disentangle the noise from the true performance. We also use two measures of competitiveness at the province level. The first is the proportion of mayors that are never promoted in each province during our fifteen years of data, which is equivalent to one minus the promotion rate. The second measure is the average tenure of positions above the bureaucratic rank of mayors. In provinces with longer tenure at these upper-level positions (and thus less turnover), mayors have fewer opportunities of being promoted and must work harder at proving themselves worthy of promotion.[38] As these measures have no cardinal interpretation, we normalize them to have mean zero and standard deviation of one. For both noisiness and competitiveness, we also use the average of these measures as a third measure. In all cases, we assume that the noisiness and competitiveness have constant effects on the probability of promotion within a given province. These are natural assumptions since promotions for mayors are determined at the province level.

4.2 Does Reported OCP Performance Increase the Probability of Promotion?

We begin by showing the correlation of reported OCP performance and promotion in Figure 6. The x-axis represents the residualized OCP performance and the y-axis represents residualized promotion probability, where we control for person, city, and year fixed-effects. Panel (a) of Figure 6 shows the relation in the subsample where the reported birth rate is above target (negative OCP performance); we do not observe any correlation between reported OCP performance and promotion. Panel (b) of Figure 6 plots the relation when the reported birth rate is equal to or below target (non-negative OCP performance). In this case, OCP performance is positively correlated with probability of promotion. This is consistent with anecdotal evidence that local officials are rewarded for their OCP performance only if they have met the birth rate target.

We focus our regression analysis in the subsample with non-negative OCP performance.[39] The baseline regression results in Table 2 show similar findings to those presented in Panel (b) of Figure

[38] In order to implement this strategy, we digitized hard-copy records on the term information of all province-level officials ranked higher than mayors. The average tenure of provincial officials ranges from 3 to 6 years across provinces. The distribution of average tenure across provinces is presented in Figure A.3.

[39] We also present the estimates using the full sample in Appendix Table A.2.

6. Consistent with the graphical presentation, estimates from column (1) through (4) all show that mayors with better OCP performance are more likely to be promoted. In this and other tables, we focus on the results from the richest specification in column (4). Decreasing birth rates by 1 per 1000 increases the chance of promotion by 1.4 percentage points, or around 10% of the probability of promotion. To gauge this magnitude, consider that the interquartile range of OCP performance, conditional on the regression model, is 1.2. Thus, if a mayor's OCP performance increases from the 25th- to the 75th-percentile of the distribution, her probability of promotion increases by 12%. To compare with GDP, we also show the estimate of log GDP and find that increasing GDP by 1% increases the chance of promotion by 19.2 basis points. These estimates suggest an economically large effect of OCP performance compared to economic growth, since decreasing the birth rate by 1 per 1000 is equivalent in its effect on promotion to a 7% increase in GDP.

Relative to the predictions of our model, we find that $\beta_1 > 0$, which rules out Prediction 1. To test Predictions 2 and 3, we further examine whether, and in which direction, the effects of OCP on promotion vary by the noisiness and competitiveness of the environment. Section 4.4 explores a battery of additional robustness checks.

4.3 Do Signal Noise and Competitiveness Affect the Promotion Rule?

Table 3 presents estimates of Equation 6. Column (1) reports our preferred estimate from Table 2 for comparison. Column (2) reports a negative coefficient for the interaction of reported OCP performance and the standard deviation of migration, indicating that the marginal effect of increased OCP performance on promotion is decreasing in this measure of noisiness. In columns (3) and (4), we replace the migration measure with the standard deviation of the census birth rate and with the average of the two measures, respectively, and find strikingly similar results. Table 3 also presents estimates of marginal effects at different points in the distribution of our noise measures as well as the p-value of a one-sided test of the hypothesis that $\beta_2 > 0$. We find consistent results in all specifications with marginal effects that are decreasing and statistically significant at the 25th- and 50th-percentiles.

Figure 7a plots estimates of marginal effects normalized by the average probability of promotion using estimates from column (4) for different quantiles of the distribution of average noise, with larger quantiles indicating a noisier signal. The y-axis is the predicted percentage change in the probability of promotion of increasing OCP performance by 1 per 1000. In the visual presentation, the effect of OCP performance on promotion continuously decreases as the signal becomes noisier. In provinces where the signal is the noisiest, the effect of OCP performance on promotion is null. By contrast, in provinces in the 20th-percentile of the distribution of noisiness, an increase in OCP performance leads to a 20% increase in the probability of promotion.

Table 4 presents estimates of Equation 7 using a similar layout to Table 3. Columns (2)-(4) report negative coefficients for the interactions of OCP performance with our different measures of competitiveness. The one-sided tests reject the hypotheses that $\beta_3 > 0$ at least at the 5% level. Similarly, we find decreasing marginal effects that are statistically significant at lower quantiles of the competitiveness measures. Figure 7b uses the results in column (4) to plot estimates of the percentage increase in the probability of promotion from lowering the birth rate by 1 per 1000 at different quantiles of average competitiveness and finds a quantitatively similar pattern to that of Figure 7a. Overall, we find that, in provinces where promotions are more competitive, the marginal effect of reported OCP performance on promotion is smaller, that is, $\beta_3 < 0$.

One potential concern is that our measures of noise and competitiveness are strongly correlated such that Tables 3 and 4 are not providing independent evidence. Table A.3 explores this possibility and shows that our noisiness measures are not statistically related to the competitiveness measures. Indeed, at most 4% of the variation in competitiveness can be explained by the noise measures, and vice versa. In addition, Table A.4 estimates β_2 and β_3 jointly and finds similar results to Tables 3 and 4. Figure 7c reports marginal effects as a function of both noise and competitiveness. To ease interpretation, we only report statistically significant marginal effects.

To summarize, we find that $\beta_1 > 0$, $\beta_2 < 0$, and $\beta_3 < 0$. Prediction 3 fits the data best; Predictions 1 and 2 are ruled out. These results show that provincial governors are instructed by the central government to value OCP performance both because population control is inherently valued and because doing so may select high-ability mayors for promotions.[40]

4.4 Robustness

We explore the sensitivity of our results to a host of potential problems, including time-varying political connections as a source for endogeneity, birth rate targets that may vary at the prefecture-level, measurement error in OCP performance, as well as alternative specifications of our estimating equation.

4.4.1 An Instrumental Variable for Reported OCP Performance

We now turn to an instrumental variables approach, which alleviates concerns that time-varying unobservable factors, such as expanding political networks, are biasing our results. Our strategy leverages the fact that birth rate targets are set at the province level by the central government in five-year plans. Changes in these targets generate "surprise changes" in reported OCP performance among mayors in office. For example, if there is a decrease in the birth rate target, it is harder for mayors to get closer to the target and thus achieve a better OCP performance. We use decreases in the birth rate target to instrument for reported OCP performance.[41] Figure 5a shows the average birth target from 1985 to 2000. Birth rate targets were changed twice during these fifteen years; the 1990 plan saw an average increase from 1986-90 to 1991-95 and the 1995 plan saw an average decrease from 1991-95 to 1996-2000. For a given plan, however, there was substantial variation in whether a province experienced an increase or a decrease in target. Figure 5b shows that 13 provinces saw a decrease in the target in the 1985 plan, while 21 provinces saw a decrease in the 1995 plan. The exclusion restriction is that target changes that occur as part of the five-year plans

[40] These results also discipline alternative models. For instance, while we assume that ω is fixed across provinces, one could alternatively consider province-varying tastes for meritocracy. However, in order for this story to match our empirical results, it would have to be the case that very competitive provinces and provinces where output is a noisier measure of effort and ability are precisely the provinces that have low tastes for meritocracy, which seems unlikely.

[41] We use negative changes in targets to avoid analyzing cases where mayors are promoted by "getting lucky" through a relaxation of standards. In unreported results, we find a similar pattern when we use all changes in targets as the instrument.

are not otherwise correlated with unobserved mayor characteristics that also affect promotion.

Table 5 presents results from this strategy.[42] Column (1) presents the first-stage estimate, which displays a strong and positive correlation between decreases in birth rate targets and reported OCP performance; the F-value of the first-stage coefficient is 25. Column (3) presents the 2SLS estimate, which is slightly larger than the OLS estimate in column (2). Decreasing birth rates by 1 per 1000 increases the chance of promotion by 2.5 percentage points, which represents a 17% increase in the probability of promotion. This estimate has a similar economic magnitude, falls within the range of estimates in the previous section, and is not statistically different from the OLS estimate. However, one interpretation of a larger effect is that well-connected candidates for promotion might be assigned to "problem places" with larger challenges. An alternative interpretation is that the 2SLS estimate might reduce measurement error in OCP performance, leading to a larger estimate. As is often the case with IV estimates, these interpretations are at best speculative given the loss in statistical precision.

While the exclusion restriction is fundamentally untestable, we provide corroborating evidence of its plausibility. First, one concern is that province targets are set to favor a particular mayor within a province. While this does not seem feasible given that most provinces have five or more prefectures, we nevertheless analyze the potential for this concern. For example, if politically-connected mayors performed worse in birth control than unconnected ones, the birth rate target might be raised to help connected mayors improve their performance. Although an increase in target could favor every mayor within a province, only those staying in office after the change experience the benefit. We test this possibility in Table A.5, Panel A. We split the sample into two parts: column (1) uses the subsample in provinces and years with an increase in birth rate target, and column (2) uses the subsample in provinces and years with a decrease in birth rate target. In both subsamples, we fail to find evidence that the OCP performance prior to a target change is correlated with whether they stay in office after the change. A second concern is that if connected mayors anticipate a change in the target, there could be selection on whether they are promoted prior to the change. We test this hypothesis in Panel B and we do not find a statistically significant correlation between future changes in birth rate targets and promotion, suggesting that the target is not changed to favor some (connected) mayors. Finally, one might be concerned that mayors respond to a decrease in target by reporting lower birth rates. Panel C indicates that changes in birth rate target do not significantly change the difference between the birth rate from census data and reported birth rate, which rules out this last concern.

We also test whether 2SLS estimates of the effect of OCP performance on promotion differ by noisiness and competitiveness. In Table A.6, we include the interaction of OCP performance with our noisiness measures, which we instrument with interacted versions of decreases in targets. Consistent with the results in Table 3, the OCP performance has a smaller effect on promotion in noisier environments. In Table A.7, we estimate the average effect of OCP performance on promotion allowing for heterogeneous effect across regions with low versus high competitiveness.[43] We instrument for low competition interacted with OCP performance using low competition interacted

[42] Note that the sample is smaller than that in column (4) of Table 2 because the birth rate target data are unavailable in a few years in a few provinces.

[43] We define low competitiveness as the lower tercile of the distribution.

with the decrease in target, and for high competition interacted with OCP performance using high competition interacted with the decrease in target. The 2SLS results are consistent with the baseline results that the promotion incentive is smaller in more competitive environments.

4.4.2 Using Estimated Prefecture-Level Targets

To the best of our knowledge, mayors are evaluated using province-level targets. However, a potential concern is that the relevant target for mayors' evaluations is subcontracted to prefecture-level governments. If this were the case, measurement error in OCP performance using province-level targets might affect our estimates. We address this concern by estimating an allocation rule of birth rate targets across provinces and using this rule to predict targets at the prefecture level. Table A.8 reports the estimated allocation rule at the province level. We find that higher birth rate targets are allocated to provinces with a higher number of women of reproductive age (15-45) and a higher fraction of rural women. Using these estimates and the same demographic measures at the prefecture level, we predict a prefecture-level birth rate target.

Table A.9 shows that our main results are robust to using our estimated province-level targets. Column (1) shows that controlling for the prefecture-level demographic variables used in Table A.8 results in similar average estimates to those in Table 2. Columns (2)-(4) considers different linear combinations of the province- and prefecture-level measures, which result in statistically and economically similar estimates. Further, columns (5)-(7) use the average of these measures in the comparative static analysis, which result in similar interactions with our measures of noise and competitiveness, confirming the role of meritocracy in the promotion rule.

4.4.3 Measurement Error

We now perform a set of analyses where we leverage our two measures of birth rate targets (province- and prefecture-level) to assuage concerns of potential measurement error. Following the repeated measures literature (see, e.g., Bound et al. (2001)), we use one measure as an instrument for the other. Tables A.10 and A.11 present results from both iterations of this procedure. In both cases, we find very similar estimates of the main effect of OCP performance on the probability of promotion as well as similar comparative static results that support our conclusion that $\beta_1 > 0$, $\beta_2 < 0$, and $\beta_3 < 0$.

4.4.4 Alternative Specifications

As additional robustness checks, we also fit a spline form in Table A.12 where OCP performance reported is interacted with indicators of being below the target and being above the target, respectively, controlling for the full set of controls. We find similar results that non-negative OCP performance is positively correlated with promotion. We also explore whether lagged OCP performances in the past four years affect our contemporaneous estimate in Table A.13 and find that our main result is robust to including lagged OCP performance in the regression.

5 Empirical Evidence of Manipulation and Screening Efficacy

The previous section shows that reported OCP performance has a positive and substantively large effect on the probability that a given mayor is promoted. Moreover, tests of comparative statics further support the view that the promotion rule is consistent with a meritocratic objective. However, it is still an open question whether such a tournament mechanism with non-contractible output is able to screen successfully for high-ability mayors, and whether the population audits have an effect on misreporting behavior.

5.1 Effects of Audits on Output and Data Manipulation

As shown in Figure 4, census data indicate that birth rates are higher than in the reported data for most levels of reported birth rates. However, the difference between the reported birth rate and the actual birth rate from the census could indicate data misreporting, or measurement error. Prediction 4 enables us to distinguish empirically between the cases of contractible and non-contractible output and suggests that, if no manipulation is taking place and mayors are truthfully revealing their performance, the difference between these two data sources should not depend on whether an audit is taking place.

Prediction 4: *If birth rates are contractible, then audits should not affect the degree of manipulation.*

As discussed in Section 1.3, the central government uses population census and national fertility surveys to investigate the actual birth rates and the credibility of reported birth rates, which are organized at the province level. The audit year is the year before the census or fertility survey when the actual birth rates are fully observed. Equation 8 tests whether the difference between reported birth rate and birth rate from the census is smaller one year prior to the census or national fertility survey (i.e. the audit year):

$$Birth\ Rate_{cpt}^{census} - Birth\ Rate_{cpt}^{reported} = \delta Audit_t + f(t) + X_{icpt}\gamma + \mu_i + \eta_{cp} + \varepsilon_{icpt}, \tag{8}$$

where the binary variable $Audit_t$ is equal to 1 in years 1987, 1989, 1991, 1994, 1996, and 1999. We include a flexible year trend $f(t)$. If the difference indeed suggests data manipulation, we should observe that $\delta < 1$. If this is the case, we further examine whether the decrease in the difference from these two data sources comes from higher reported birth rates, suggesting less manipulation, or from lower actual birth rates in census, indicating actual improvement in OCP enforcement.

Table 6 presents estimates of Equation 8. In column (1), we find that the difference between reported birth rate and actual birth rate from the census is smaller in audit years. This is consistent with Prediction 4 and is evidence that mayors manipulate reported birth rates. We further examine whether the decrease in the difference from these two data sources comes from higher reported birth rates, suggesting less manipulation, or lower actual birth rates, indicating actual improvement in OCP enforcement. Columns (2) and (3) suggest that 51% of the decrease in the difference is attributable to higher reported birth rates in audit years, while 49% is attributable to mayors exerting more effort to lower the actual birth rate. Finally, if lower birth rates and higher GDP growth rate are substitutes, we would expect that, in audit years when mayors reported higher birth rates (thus doing worse on the OCP dimension), mayors might work harder to improve GDP or report higher GDP numbers. We find that this is indeed the case in column (4).

5.2 Screening Ability in the Presence of Misreporting

Our fifth and final prediction describes how the expected ability of the promoted mayor depends on scope for manipulation.

Prediction 5: *If birth rates are contractible, then the expected ability of the promoted mayor is higher than the population average. When birth rates are non-contractible, and mayors are therefore manipulating reported birth rates, the expected ability of the promoted mayor approaches the population average as output becomes completely non-verifiable.*

Prediction 5 suggests that, in the presence of misreporting in the reported OCP performance, promoted and unpromoted mayors could be similar in their actual OCP performance. We test this hypothesis in Equation 9:

$$Promoted_{icpt} = \beta_4 OCP^{census}_{cpt} + X_{icpt}\gamma + \mu_i + \eta_{cp} + \lambda_t + \varepsilon_{icpt}, \quad (9)$$

where the key regressor of interest is the OCP performance measure from census data, measured as $OCP^{census}_{cpt} = Target_{pt} - Birth\ Rate^{census}_{cpt}$. Our theory predicts that $\beta_4 \approx 0$ in equilibrium.

Prediction 5 suggests that, in the presence of misreporting, the promotion mechanism is closer to simply choosing a mayor at random. Table 7 presents estimates of Equation 9 using the same sample restrictions as in Table 2. From column (1) through column (4), results from all specifications suggest that actual OCP performance is not significantly predictive of promotion. These findings imply that promoted mayors are not significantly more able to lower actual birth rate than mayors who are not promoted, which is supportive of Prediction 5.

Table 7 uses the best information available in the census to account for migration. In Table A.14, we explore the potential for migration to explain our null results by studying the effect of removing migration controls.[44] Similarly, in Table A.15 we follow the robustness checks described in Section 4.4. In both cases, we find that migration controls, 2SLS estimates, prefecture-level targets, and corrections for measurement error deliver economically small and statistically insignificant correlations between promotion and actual performance. This suggests that the lack of correlation between actual OCP performance and promotion is not a statistical anomaly, but rather a result of the impaired capacity of the tournament mechanism to screen for ability when output is non-contractible and reported performance is manipulated.

6 Conclusion

This paper analyzes the role of meritocracy in determining the promotion of mayors in China. We document that, despite potential for corruption through political connections, promotion rules are partly driven by perceived performance in implementing the OCP. Moreover, we show that the

[44] This analysis investigates the potential measurement error from not directly observing migration before 1995 (when the migration rate was below 4%). We repeat the specification in column (4) of Table 7, with various incomplete controls for migration and using the same subsample, and report the results in column (1) through column (3) in Table A.14; the main estimate is not sensitive to including these controls.

relationship between performance and promotion is determined by a desire to screen high-ability mayors for higher office. While we confirm that observed promotion decisions are consistent with a meritocratic objective, the efficacy of this screening mechanism is weakened by mayors' ability to manipulate reported outcomes. Empirically, we find that mayors manipulate less in audit years (that is, when monitoring is increased), which is consistent with the importance of OCP as a performance metric. Nonetheless, we find that audits are not able to resolve the fundamental problem of non-contractible output.

The combination of theory and empirical analysis makes our findings particularly compelling and demonstrates the importance of interpreting empirical results through the lens of a rigorous model of incentives. Without guidance from our model, the applied econometrician could arrive at the mistaken conclusion that meritocracy was not a driving force in the Chinese government, as promoted mayors do not appear to be of higher ability than mayors who are not promoted. However, by testing more subtle predictions of our model, we are able to separate the desire to implement the OCP from the meritocratic objective, a distinction which previous studies of promotion based on other measures of performance were not able to address.

We conclude by noting that, while critics of the implementation of the OCP point toward local government promotion incentives as a cause for human rights abuses, including forced abortions and sterilizations (see, *e.g.*, Wong (2012)), the alternative piece-rate compensation mechanism would likely lead to more such cases as effort from lower-ability mayors would likely increase. Moreover, one consequence of the non-contractibility and manipulation of birth rates is that marginal incentives may have little or no effect on actual birth rates, even though the policy on the whole may lead to human rights abuses.

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Figure 1: Official Document From Fujian Province

福建省人口和计划生育工作
责任考核奖惩办法(试行)

第一条 为了稳定低生育水平，提高人口素质，确保人口和计划生育工作目标的实现，为建设海峡西岸经济区和我省全面建设小康社会创造良好的人口环境，根据《中华人民共和国人口与计划生育法》、《中共中央国务院关于加强人口与计划生育工作稳定低生育水平的决定》和《福建省人口与计划生育条例》及其他有关规定， 制定本办法。

第二条 市、县(区)、乡镇(街道)党委、政府(办事处)， 省、市、县(区)党委、政府工作部门，村(居)党组织和村(居) 民委员会、企事业单位、各社会团体和相关责任人，在人口和计划生育工作中应给予奖励或追究责任的，适用本办法。

第三条 对在人口和计划生育工作中作出显著成绩的单位和个人，给予精神和物质奖励。成绩突出的，分别对党政主要领导、分管副职和人口计生委(局)；主任(局长)给予奖励，并发给奖金。

第四条 有下列情形之一的，对有关单位和相关责任人应予以追究责任：

(一)未完成年度人口和计划生育工作主要责任目标的。

市、县(区)党委、政府及计生行政部门的主要责任目标为六项指标：1、出生人口政策符合率；2、出生人口性别比；3、统计准确率；4、群众满意率；5、计划生育基本知识知晓率；6、工作经费投入。

其他单位的主要责任目标为上述指标的第1、5、6项。

(二)违反国家人口计生委规定的“七个不准”，发生重大恶性案件的；

(三)在一年内对实行计划生育的公民兑现政策规定的奖励低于当年度应奖励总量的70%的；

(四)虚报、瞒报、漏报、伪造、篡改或者拒报人口和计划生育统计数据，报表统计准确率低于95%的；

(五)在经费投入上弄虚作假，截留、挪用、克扣计划生育经费的；

(六)对违反计划生育政策的党员和干部及村(居)民委员会成员未按有关规定处理，造成恶劣影响的；

(七)有关部门没有履行计划生育综合治理职责的，或制定出台的政策规定不利于计划生育工作开展的；

(八) 因工作不力，造成计划生育工作严重滑坡的；被计划生育领导小组黄牌警告或单列管理的；

(九)机关、企事业单位人员违反生育政策被发现后未及时处理的；

(十)村(居)班子软弱涣散或处于瘫痪状态，又未及时调整整顿，造成计划生育工作无人管理或失控的；

(十一)人口和计划生育部门及其工作人员不依法履行管理和服务职责的。

对上述情形按如下办法认定：

出现第(一)项情形的， 以上级人口和计划生育部门对其年度人口和计划生育工作目标责任制考核的结果为准。

出现第(二)至第(十一)项情形的，由上级人口和计划生育行政部门负责核实。涉及到需要进行人事调整或党纪；政纪处分的，会同组织人事部门或纪检监察机关核实。

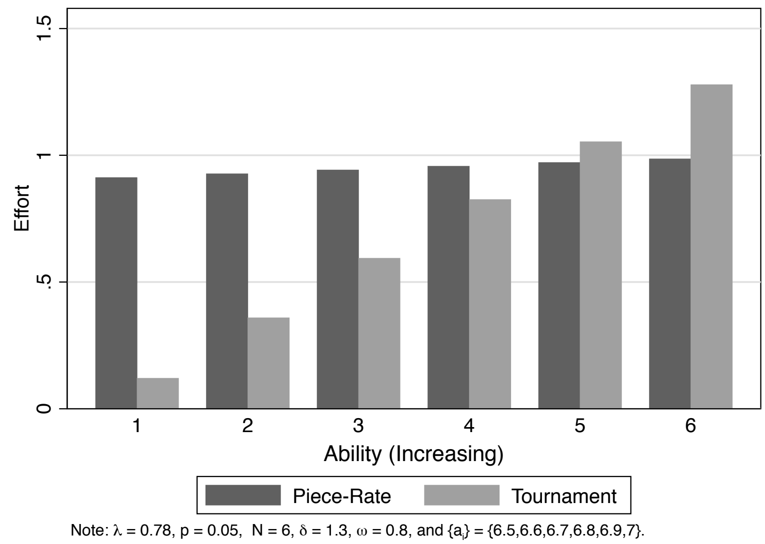
第五条 被列为追究责任的单位，取消其当年度综合性荣誉称号和综合性评先评奖资格。其应负责任的党政主要领导或法定代表人、分管领导及直接责任人， 当年度考核中不能评为称职及以上等次，情节严重的要给予免职、责令辞职，并给予相应的党纪政纪处分。对应负责任而已调离岗位的，一年内要跟踪处理。

第六条 出现第四条(一)、 (六)、 (八)、(十)项规定情形的，对单位和党政主要领导或法定代表人；出现第四条其它项规定情形的，对有关部门及其分管领导和直接责任人，均按第五条规定给予相应的责任追究。

第七条 人口和计划生育行政部门负责对年度人口和计划生育目标管理责任制执行情况进行考核。考核中要注重检查单位和领导干部履行职责的情况。考核结果要向同级党委、政府或人口和计划生育领导小组和上级计生行政部门报告，提出实行计划生育工作奖励或责任追究的建议。向时，向同级组织人事部门和纪检监察机关通报有关情况。

Note: This document from Fujian Province outlines guidelines for local officials on the One Child Policy and links performance to promotion outcomes. The first highlighted section states that local officials are responsible for reporting accurate birth rates and other OCP statistics. The second highlighted section states that local officials should ensure the accuracy of the reported numbers and avoid underreporting, misreporting, faking, and excluding birth rate statistics. Finally, the third highlighted section states that the province government is responsible for investigating violations of these guidelines. If they are violated, the responsible officials are denied positive credits in their annual evaluation, and their records are sent to the personnel department of the province government. Source: http://yz.zfxxgk.gov.cn/ShowArticle.asp?ArticleID=75204

Figure 2: Numerical Example of Effort Separation

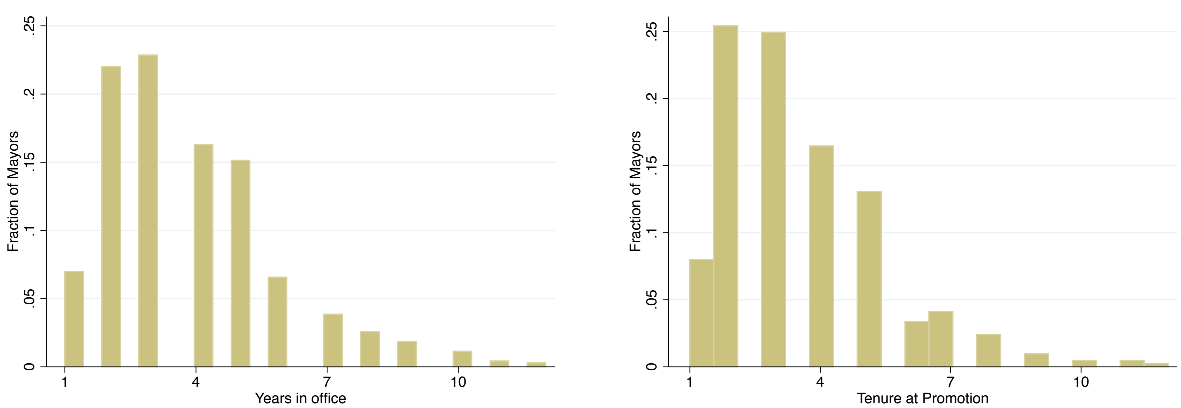


Note: This figure plots equilibrium effort levels under the optimal piece-rate and tournament compensation mechanisms given a set of parameter values. The figure shows that tournaments lower overall effort but increase effort separation across mayors of different abilities.

Figure 3: Histogram of Years in Office

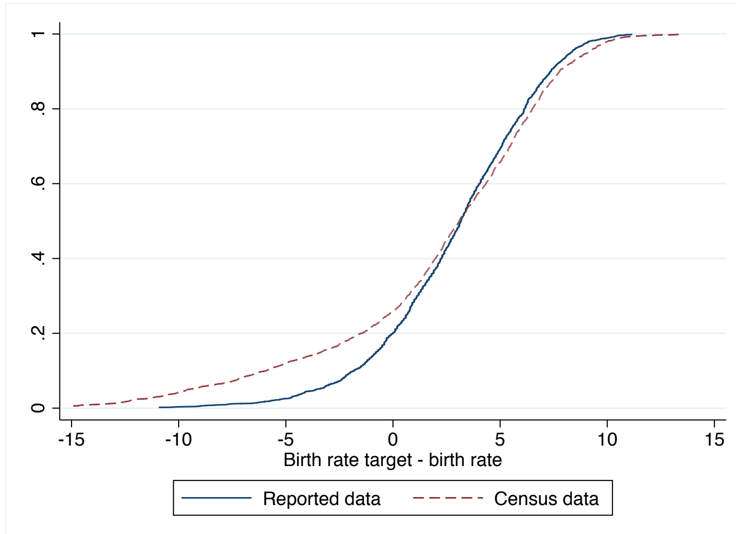
(a) Histogram of Years in Office

(b) Tenure at Promotion



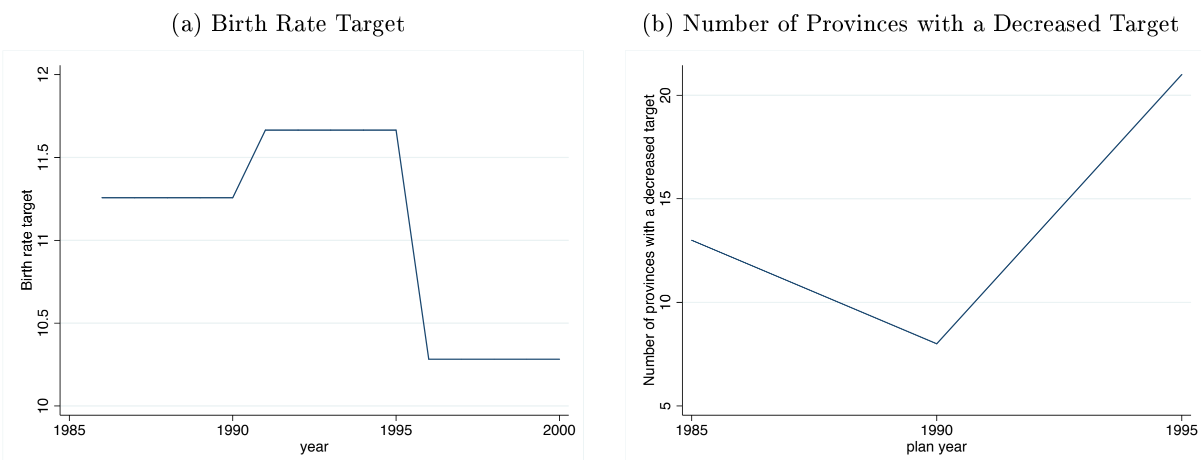
Notes: Figure 2a shows the distribution of years in office per mayor. Figure 2b shows the distribution of tenure at promotion of mayors who were promoted.

Figure 4: Distribution of the OCP performance measure (birth rate target - birth rate)



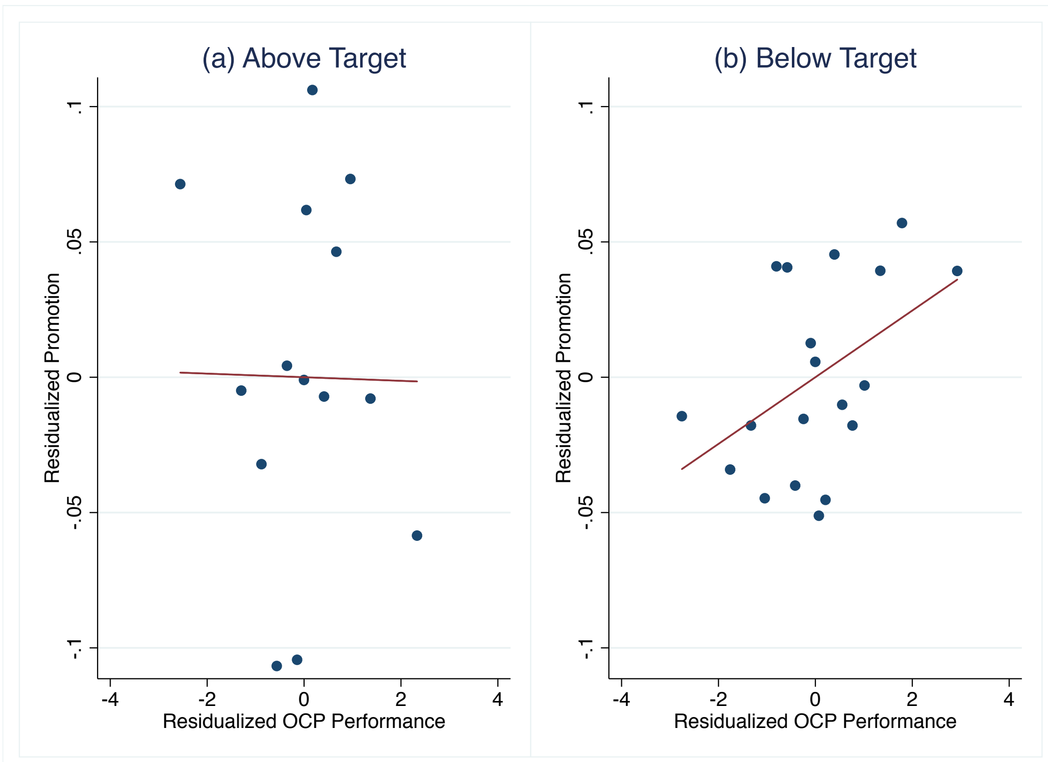
Notes: Figure 3 plots the cumulative distribution functions of the two OCP performance measures (birth rate target - birth rate), based on reported data and census data respectively.

Figure 5: Birth Rate Targets



Notes: Figure 4a shows the average birth rate target across provinces set in five-year plans. Figure 4b presents the number of provinces that experienced a decrease in the target in each of the five-year plans in 1985, 1990 and 1995.

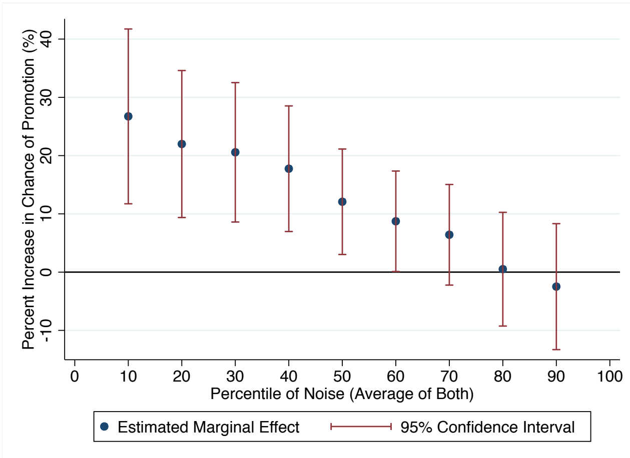
Figure 6: OCP Performance and Promotion



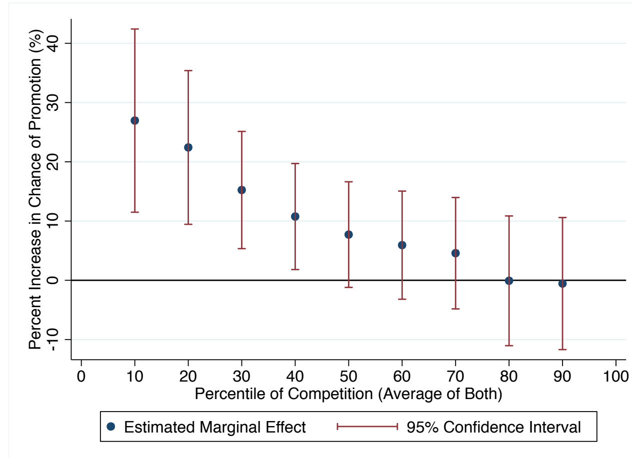
Notes: In Figure 5, the x-axis represents the residualized OCP performance and the y-axis represents the residualized promotion probability where we control for person, city, and year fixed-effects. OCP performance reported is the birth rate target minus the reported birth rate. Panel (a) shows the relation in the subsample where the reported birth rate is above target (negative OCP performance). Panel (b) plots the relation when the reported birth rate is equal to or below target (non-negative OCP performance).

Figure 7: Heterogeneous Effects of OCP on Promotion

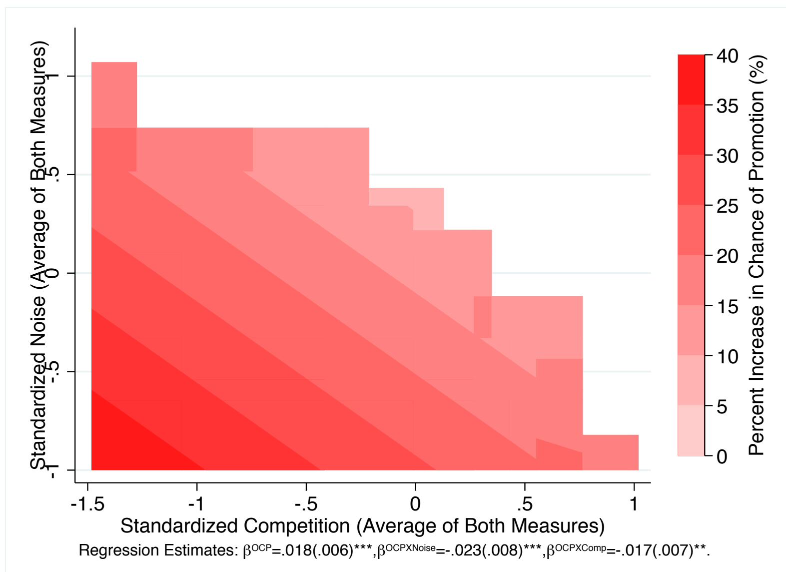
(a) OCP Promotion and Outcome Noise



(b) OCP Promotion and Agent Competition



(c) Marginal Effects of OCP Promotion by Noise and Competition



Notes: In Figure 6a, the x-axis represents different percentiles of the distribution of the average noisiness measure; the higher the percentile, the noisier the signal. The y-axis is the predicted percentage change in the probability of promotion of increasing OCP performance by 1 per 1000. The figure is plotted using estimates in column (4) of Table 3. In Figure 6b, the x-axis represents different percentiles of the distribution of the average competitiveness measure; the higher the percentile, the more competitive the tournament. The figure is plotted using estimates in column (4) of Table 4. Figure 6c plots marginal effects of increasing OCP performance by 1 per 1000 on the probability of promotion using estimates from Table A.4. For ease of interpretation, the figure only displays statistically significant effects.

Table 1: Summary Statistics

	(1) Mayor			(2) Mayor-year		
	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs
Promotion						
Promoted	0.53	0.5	697	0.15	0.35	2058
Prefecture party secretary	0.45	0.5	697	0.12	0.33	2058
Province government or party leaders	0.06	0.24	697	0.02	0.13	2058
Central ministries	0.02	0.13	697	0	0.07	2058
Tenure (year)	3.79	2.03	697	2.76	1.86	2249
Birth rate (per 1,000 population)						
Recorded birth rate	7.66	3.29	697	7.63	3.71	2058
Birth rate from census	8.28	5.52	675	8.43	5.74	1895
Birth rate target	10.57	2.32	697	10.53	2.51	2058
OCP performance						
Reported birth rate is below target (%)	0.8	0.31	697	0.8	0.4	2058
Birth rate target - reported birth rate	2.91	3.19	697	2.9	3.7	2058
Birth rate from census is below target (%)	0.74	0.4	675	0.74	0.44	1895
Birth rate target - birth rate from census	2.27	5.16	675	2.14	5.42	1895
Real GDP (million RMB)	8517	11359	697	9348	12255	2058
Log (GDP)	3.89	1.04	697	3.99	1.06	2058
Prefecture-year controls						
Population (1,000)	5383	49415	697	6132	114802	2058
Percentage of urban population	0.31	0.17	697	0.32	0.17	2058
Investment (million RMB)	3973	9187	697	4382	10463	2058

Notes: Please refer to Section 3 for details on data sources.

Table 2: OLS Regression of Promotion on Reported OCP Performance

	Promotion = 1			
	(1)	(2)	(3)	(4)
OCP Performance Reported	0.010***	0.012*	0.012*	0.014**
	(0.004)	(0.007)	(0.007)	(0.007)
Log GDP	-0.010	0.116**	0.116**	0.192***
	(0.011)	(0.052)	(0.052)	(0.072)
Observations	1,593	1,593	1,593	1,593
R^2	0.07	0.56	0.56	0.57
Mean of Dependent Variable	0.14	0.14	0.14	0.14
Year FE	Y	Y	Y	Y
Person FE		Y	Y	Y
City FE			Y	Y
Prefecture-year controls				Y

Notes: OCP performance reported is the birth rate target minus the reported birth rate. Tenure fixed effects and migration controls are included in all regressions. Prefecture-year controls include log(population), percentage of urban population and log(government investment). Standard errors are clustered at province-year level. Tables A.12 and A.13 explore additional specifications of this regression. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table 3: Heterogeneous Effects of Reported OCP Performance on Promotion by Signal Noise

	(1)	(2)	(3)	(4)
OCP Performance	0.014**	0.017**	0.016**	0.018***
	(0.007)	(0.006)	(0.007)	(0.007)
OCP Performance X Noise (SD Migration)		-0.017***		
		(0.006)		
OCP Performance X Noise (SD Birth Rate)			-0.014*	
			(0.008)	
OCP Performance X Noise (Average of Both)				-0.026***
				(0.008)
Log GDP	0.192***	0.201***	0.184**	0.191***
	(0.072)	(0.072)	(0.072)	(0.072)
Observations	1,593	1,593	1,593	1,593
R^2	0.569	0.574	0.571	0.574
Mean of Dependent Variable	0.142	0.142	0.142	0.142
Year FE	Y	Y	Y	Y
Person FE	Y	Y	Y	Y
City FE	Y	Y	Y	Y
Prefecture-year controls	Y	Y	Y	Y
Marginal Effect at 25th pctil		.03***	.025***	.031***
		(.009)	(.01)	(.009)
Marginal Effect at 50th pctil		.019***	.012*	.017***
		(.007)	(.007)	(.007)
Marginal Effect at 75th pctil		-.003	.008	.001
		(.008)	(.007)	(.007)
One-Sided Test of Interaction (p-val)		0.002	0.044	0.001

Notes: OCP performance reported is the birth rate target minus the reported birth rate. Noise (SD Migration) is SD of gross migration (number of in-migrants + number of out-migrants) at the province-level. Noise (SD Birth Rate) is SD of retrospective birth rate in the census data at the province-level. Both noisiness measures are standardized. Noise (Both) is the average of SD Migration and SD Birth Rate. Tenure fixed effects and migration controls are included in all regressions. Prefecture-year controls include log(population), percentage of urban population and log(government investment). Standard errors are clustered at province-year level. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table 4: Heterogeneous Effects of Reported OCP Performance on Promotion by Competitiveness

	(1)	(2)	(3)	(4)
OCP Performance	0.014**	0.015**	0.014**	0.015**
	(0.007)	(0.006)	(0.007)	(0.006)
OCP Performance X Competitiveness (Tenure)		-0.012*		
		(0.007)		
OCP Performance X Competitiveness (1-Pr Rate)			-0.014**	
			(0.006)	
OCP Performance X Competitiveness (Average of Both)				-0.020***
				(0.007)
Log GDP	0.192***	0.197***	0.190***	0.195***
	(0.072)	(0.072)	(0.072)	(0.072)
Observations	1,593	1,593	1,593	1,593
R^2	0.569	0.571	0.572	0.573
Mean of Dependent Variable	0.142	0.142	0.142	0.142
Year FE	Y	Y	Y	Y
Person FE	Y	Y	Y	Y
City FE	Y	Y	Y	Y
Prefecture-year controls	Y	Y	Y	Y
Marginal Effect at 25th pctil		.02***	.027***	.032***
		(.007)	(.009)	(.009)
Marginal Effect at 50th pctil		.017***	.012*	.011*
		(.007)	(.006)	(.006)
Marginal Effect at 75th pctil		.004	.005	.001
		(.009)	(.007)	(.008)
One-Sided Test of Interaction (p-val)		0.037	0.005	0.003

Notes: OCP performance reported is the birth rate target minus the reported birth rate. Competitiveness (Tenure) is measured by the average tenure of upper-level officials at the province level. Competitiveness (1-Pr Rate) is (1-promotion rate by province). Both competitiveness measures are standardized. Competitiveness (Both) is the average of Competitiveness (Tenure) and Competitiveness (1-Pr Rate). Tenure fixed effects and migration controls are included in all regressions. Prefecture-year controls include log(population), percentage of urban population and log(government investment). Standard errors are clustered at province-year level. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table 5: Instrument Variable Regression of Promotion on Reported OCP Performance

	OCP Performance Reported	Promotion = 1	
	(1)	(2)	(3)
	First Stage	OLS	2SLS
Change in Birth Rate Target	0.583***		
	(0.116)		
OCP Performance Reported		0.013*	0.025*
		(0.007)	(0.015)
Log GDP	0.251	0.170**	0.163***
	(0.441)	(0.076)	(0.057)
Observations	1,515	1,515	1,515
R^2	0.79	0.58	
Mean of Dependent Variable		0.15	0.15
First-Stage F-Stat			25.46
Hausman Test (Stat)			0.25
Hausman Test (P-Val)			0.62
Year FE	Y	Y	Y
Person FE	Y	Y	Y
City FE	Y	Y	Y
Prefecture-year controls	Y	Y	Y

Notes: OCP performance reported is the birth rate target minus the reported birth rate. Tenure fixed effects and migration controls are included in all regressions. Prefecture-year controls include log(population), percentage of urban population and log(government investment). Standard errors are clustered at province-year level. Table A.5 tests potential violations of the exclusion restriction. Tables A.6 and A.7 explore heterogeneous effects by noisiness and competitiveness using this IV strategy. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table 6: Effects of Population Audits

	(1)	(2)	(3)	(4)
	Census - Reported Birth Rates	Reported Birth Rate	Census Birth Rate	Log GDP
Audit Year	-0.371***	0.190	-0.181	0.172***
	(0.126)	(0.134)	(0.174)	(0.020)
Observations	1,479	1,479	1,479	1,479
R^2	0.84	0.81	0.92	0.98
Cubic Year Trend	Y	Y	Y	Y
Person FE	Y	Y	Y	Y
City FE	Y	Y	Y	Y
Prefecture-year controls	Y	Y	Y	Y

Notes: Audit years include the year before the census year in 1990 and 1995, and the year before the national fertility survey in 1988, 1992, and 1997. Tenure fixed effects and migration controls are included in all regressions. Prefecture-year controls include log(population), percentage of urban population and log(government investment). Standard errors are clustered at province-year level. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table 7: OLS Regression of OCP Performance from Census on Promotion

	Promotion = 1			
	(1)	(2)	(3)	(4)
OCP Performance from Census	0.005*	0.004	0.004	0.005
	(0.003)	(0.007)	(0.007)	(0.007)
Log GDP	-0.012	0.102**	0.102**	0.163**
	(0.012)	(0.051)	(0.051)	(0.072)
Observations	1,483	1,483	1,483	1,483
R^2	0.07	0.58	0.58	0.58
Year FE	Y	Y	Y	Y
Person FE		Y	Y	Y
City FE			Y	Y
Prefecture-year controls				Y

Notes: OCP performance from census is measured by the birth rate target minus the birth rate from census data. Tenure fixed effects and migration controls are included in all regressions. Prefecture-year controls include log(population), percentage of urban population and log(government investment). Standard errors are clustered at province-year level. Tables A.14 and A.15 explore additional robustness of the results in this table. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Online Appendices Not For Publication

A Appendix - Theory

A.1 Approximation of the probability that a_i produces the maximum output

We approximate $\Pr(y_i \; is \; \max|e_1, ..., e_N)$ in the following way.[45] Recall that the expected value of the maximal order statistic for N iid draws from an exponential distribution with parameter λ is:

$$E[\varepsilon_{(N)}] = \left(1 + \frac{1}{2} + ... + \frac{1}{N}\right)\frac{1}{\lambda}.$$

We approximate the probability that y_i is the maximal output in the following way:

$$\begin{aligned} \Pr(y_i \; is \; \max|e_1, ..., e_N) &\approx \Pr\left(y_i \geq \frac{1}{N-1}\sum_{j\neq i} y_j + \left(1 + \frac{1}{2} + ... + \frac{1}{N-1}\right)\frac{1}{\lambda}\right) \\ &= \Pr\left(\varepsilon_i \geq \frac{1}{N-1}\sum_{j\neq i} e_j - e_i + \left(1 + \frac{1}{2} + ... + \frac{1}{N-1}\right)\frac{1}{\lambda}\right), \end{aligned}$$

where $\frac{1}{N-1}\sum_{j\neq i} e_j + E[\varepsilon_{(N-1)}]$ is the expected value of the sample maximum of the realized outputs of the other (N-1) agents: $\hat{y}_i = e_i + \hat{\varepsilon}_i$.

Recall that if $\varepsilon \sim \exp(\lambda)$, then the cdf is $F_\varepsilon(x) = 1 - e^{-\lambda x}, \; x > 0$. Thus, this probability is:

$$\begin{aligned} \Pr(y_i \; is \; \max|e_1, ..., e_N) &\approx 1 - F_{\exp(\lambda)}\left(\frac{1}{N-1}\sum_{j\neq i} e_j - e_i + \left(1 + \frac{1}{2} + ... + \frac{1}{N-1}\right)\frac{1}{\lambda}\right) \\ &= \exp\left(-\lambda\left[\frac{1}{N-1}\sum_{j\neq i} e_j - e_i + \left(1 + \frac{1}{2} + ... + \frac{1}{N-1}\right)\frac{1}{\lambda}\right]\right). \end{aligned}$$

A.2 Meritocracy and the Compensation Scheme (Proof of Proposition 1)

We establish the relationship between the principal's value of meritocracy and the compensation scheme by comparing the maximal social welfare achieved under a tournament to the maximal social welfare achieved under a piece-rate for each possible value of $\omega \in [0, 1]$, where a smaller ω represents a more meritocratic objective. The compensation scheme which maximizes social welfare for a given value of ω is the scheme chosen by the principal, because utility is perfectly-transferable in our model and any equilibrium is Pareto-efficient. In other words, because the principal and the agents "maximize the pie and then split it," the compensation scheme which yields higher social welfare is preferred because it generates a larger pie to split.

We characterize the maximal social welfare that can be achieved under the piece-rate and the tournament for a given value of ω by taking the following steps. First, given any ω, we characterize

[45] Without an approximation, this expression is intractable. Additionally, we believe it is unlikely our agents are calculating extremely complex probabilities, so an approximation is also more realistic.

the effort exerted by an agent with ability a_i who faces either a piece-rate or a tournament which rewards the promoted agent with a bonus. Next, we solve for the social welfare-maximizing piece-rate and bonus when the principal cares about output only for its production value ($\omega = 1$), and show that higher social welfare is achieved under the piece-rate. Then, we solve for the social welfare-maximizing piece-rate and bonus when the principal cares about output only for its screening value ($\omega = 0$), and show that higher social welfare is achieved under the tournament. Finally, we show that the maximal level of social welfare achieved under the piece-rate increases continuously and monotonically in ω, while the maximal level of social welfare achieved under the tournament decreases continuously and monotonically in ω. By the Intermediate Value Theorem, it follows that there exists $\tilde{\omega} \in (0,1)$ such that, when $\omega > \tilde{\omega}$ and meritocracy is relatively unimportant to the principal, the compensation scheme is a piece-rate, and when $\omega < \tilde{\omega}$ and meritocracy is relatively important to the principal, the compensation scheme is a tournament.

Characterizing agent effort under the piece-rate and the tournament, given $\omega \in [0,1]$.

Suppose that the principal maximizes the following expression by setting a piece-rate, $s(\hat{y}_i) = \alpha\hat{y}_i$, to compensate agents for their reported output, as well as choosing which agent i to promote:

$$\omega E\left[\sum_{i=1}^{N} y_i\right] + (1-\omega)E[a_i|i \textit{ is promoted}].$$

An agent's effort choice in the "all lie" equilibrium, where an agent who is caught lying gets fired, solves:

$$\max_{e_i} pF + (1-p)\left[\alpha_\omega \delta e_i + \frac{\alpha_\omega \delta}{\lambda}\right] - \frac{1}{a_i}\exp(e_i).$$

Thus, a_i's equilibrium effort choice when facing the piece-rate α_ω is (where the subscript indicates that the piece-rate may depend on ω):

$$e_{i,lie}^{PR} = \log((1-p)\delta\alpha_\omega) + \log(a_i).$$

Suppose, alternatively, that the principal compensates reported output via a tournament which promotes one agent and rewards her with a bonus, B.[46] The promoted agent who is rewarded with a bonus, B, will optimally be the agent with highest reported output who is not caught lying.[47]

An agent's effort choice in the "all lie" equilibrium, where an agent who is caught lying gets fired, solves:

$$\max_{e_i} B_\omega \Pr(\hat{y}_i > \hat{y_{-i}}) - \frac{1}{a_i}\exp(e_i).$$

[46]Note that we could have allowed for a more powerful tournament which includes our structure as a case (e.g. bonuses of varying magnitudes, or a lottery over bonuses, or the possibility that no agent is promoted). However, the main point of our model is to show that sufficient value of meritocracy causes a principal to prefer a tournament. Thus, we consider the weakest possible tournament—otherwise, it could be that valuing meritocracy only causes a principal to prefer the tournament if it is sufficiently (and unrealistically) powerful.

[47]The principal has no reason to incentivize lower output, and the probability of detection increases in the magnitude of the lie.

Using the approximation in Appendix A.1, we obtain:

$$\begin{aligned} EU_{i\ lies}^{-i\ lies} &\simeq pF + (1-p)\exp\left(-\lambda\left[\frac{1}{N-1}\sum_{j\neq i} e_j - e_i\right]\right) E(p,N)B_\omega \\ &+(1-p)p^{N-1}B_\omega - \frac{1}{a_i}\exp(e_i), \end{aligned}$$

where $E(p, N)$ denotes the expected probability a_i's error is weakly greater than the maximal order statistic for the error in the population of non-fired mayors:

$$\begin{aligned} E(p,N) &\equiv \left[(1-p)^{N-1}\exp(-\lambda\bar{\varepsilon}_{N-1}) + ... + (1-p)p^{N-2}\exp(-\lambda\bar{\varepsilon}_1)\right] \\ &= \left[(1-p)^{N-1}\exp\left(-\sum_{j=1}^{N-1}\frac{1}{j}\right) + ... + (1-p)p^{N-2}\exp(-1)\right]. \end{aligned}$$

Agent a_i's expected utility breaks down in an intuitive way:

1. The first term addresses the case where a_i gets caught lying, which happens with probability p. If she gets caught, she is fired and receives $F < 0$.

2. The second term is the most complex: it addresses the case where a_i does not get caught, but various subsets of the other $(N-1)$ lying mayors are caught. All possibilities ranging from "none of the other mayors is caught" to "all but one of the other mayors are caught" are addressed in this term.

   The key observation is that the average effort of the non-detected other mayors is always $\frac{1}{N-1}\sum_{j\neq i} e_j$, regardless of how many of the other mayors are not detected. This is because the probability of detection is always p for each lying mayor. A simple example will illustrate. Suppose there are four mayors, a_1, a_2, a_3, a_4. The mayor a_1 calculates the average effort of the pool of non-fired mayors she will face, in the case that one of the other mayors is caught. This means that she might face $\{a_2, a_3\}$, or $\{a_2, a_4\}$, or $\{a_3, a_4\}$. But she faces each of these pools with equal probability. Thus, the average of the average effort in each of these pools is just $\frac{1}{3}a_2 + \frac{1}{3}a_3 + \frac{1}{3}a_4$–but that's just the average ability of the three other mayors.

   Thus, we can "factor out" $e^{-\lambda\left[\frac{1}{N-1}\sum_{j\neq i} e_j - e_i\right]}$.[48]

3. The third term addresses the case where our mayor a_i is not caught, but all the other mayors are caught. Then our mayor is promoted for sure.

4. The fourth term is the cost of effort of a_i from exerting effort e_i.

[48] Recall that $\bar{\varepsilon}_k$ is the maximal order statistic for a sample of k iid draws from the error distribution, $\exp(\lambda)$. Recall that $\bar{\varepsilon}_k = \left(1 + ... + \frac{1}{k}\right)\frac{1}{\lambda}$.

Then the first-order condition characterizing optimal effort in the "pure lie" scenario is:

$$FOC_{e_i} : (1-p)B_\omega \lambda \exp\left(-\lambda\left[\frac{1}{N-1}\sum_{j\neq i} e_j - e_i\right]\right)$$
$$\times\left[(1-p)^{N-1}\exp\left(-\lambda\bar{\varepsilon}_{N-1}\right) + ... + (1-p)p^{N-2}\exp\left(-\lambda\bar{\varepsilon}_1\right)\right] \quad = \quad \frac{1}{a_i}\exp(e_i).$$

Solving yields equilibrium effort:

$$e^T_{i,lie} \quad = \quad \frac{(N-1)}{N(1-\lambda)-1}\log(a_i) - \frac{\lambda}{N(1-\lambda)-1}\sum_{j=1}^{N}\log(a_j)$$
$$+\log[(1-p)B_\omega\lambda] + \log E(p,N).$$

Piece-rates are Optimal when $\omega = 1$.

When $\omega = 1$, social welfare is:

$$\sum_{i=1}^{N} E[e_i + \epsilon_i] - \sum_{i=1}^{N} c(e_i).$$

Let $\alpha_x \equiv \alpha_{\omega=x}$. Using our expression for effort under the piece-rate and our functional form for cost of effort, we see that the piece-rate α_1 that maximizes social welfare solves:

$$\max_{\alpha_1} E\left[\sum_{i=1}^{N}\log((1-p)\delta\alpha_1) + \log(a_i)\right] + \frac{N}{\lambda} - \sum_{i=1}^{N}\frac{1}{a_i}\exp(\log((1-p)\delta\alpha_1) + \log(a_i))\ .$$

This yields:

$$\alpha_1 = \frac{1}{(1-p)\delta},$$

which implements first-best effort, $e^{FB}_{i,\omega=1} = \log(a_i)$. Thus, the maximal level of social welfare under the piece-rate is:

$$SW_1^{PR} = \sum_{i=1}^{N}\log(a_i) + \frac{N}{\lambda} - N.$$

The tournament bonus, B_1, which maximizes social welfare solves:

$$\max_{B_1} E\left[\sum_{i=1}^{N} e^T_{i,lie}\right] + \frac{N}{\lambda} - \sum_{i=1}^{N}\frac{1}{a_i}\exp(e^T_{i,lie})\ ,$$

which yields:

$$B_1 = \frac{1}{(1-p)\lambda E(p,N)}\frac{N}{\sum_{i=1}^{N}\left[\frac{a_i * ... * a_i}{a_1 * ... * a_N}\right]^{\frac{\lambda}{N(1-\lambda)-1}}},$$

so that the maximal level of social welfare under the tournament is:

$$SW_1^T = \sum_{i=1}^{N} \log(a_i) + \frac{N}{\lambda} + N \log\left(\frac{N}{\sum_{i=1}^{N}\left[\frac{a_i*...*a_i}{a_1*...*a_N}\right]^{\frac{\lambda}{N(1-\lambda)-1}}}\right) - N^2.$$

Observe that:

$$\frac{N}{\sum_{i=1}^{N}\left[\frac{a_i*...*a_i}{a_1*...*a_N}\right]^{\frac{\lambda}{N(1-\lambda)-1}}} < 1,$$

where

$$\frac{\lambda}{N(1-\lambda)-1} = \begin{cases} -1, & \lambda = 1 \\ \infty, & \lambda = \frac{N-1}{N} \\ 0, & \lambda = 0 \end{cases}.$$

To see this, define a sequence $\{s_i\}_{i=1}^{N}$, where $s_i = a_i^{\frac{\lambda N}{N(1-\lambda)-1}} > 0\,\forall i$. Then the inequality we want to show can be re-expressed as:

$$\frac{1}{N}\sum_{i=1}^{N} \frac{s_i}{\left(\prod_{i=1}^{N} s_i\right)^{\frac{1}{N}}} > 1 \iff$$

$$\frac{1}{N}\sum_{i=1}^{N} s_i > \left(\prod_{i=1}^{N} s_i\right)^{\frac{1}{N}}.$$

This holds by the AM-GM inequality, which states that, for any sequence of non-negative real numbers, the arithmetic mean is greater than the geometric mean as long as all the terms are not equal (and holds at equality iff all the terms are equal). Hence:

$$\log\left(\frac{N}{\sum_{i=1}^{N}\left[\frac{a_i*...*a_i}{a_1*...*a_N}\right]^{\frac{\lambda}{N(1-\lambda)-1}}}\right) < 0.$$

Since $N^2 > N$, as $N > 1$, it follows that:

$$SW_1^{PR} = \sum_{i=1}^{N} \log(a_i) + \frac{N}{\lambda} - N > \sum_{i=1}^{N} \log(a_i) + \frac{N}{\lambda} + N \log\left(\frac{N}{\sum_{i=1}^{N}\left[\frac{a_i*...*a_i}{a_1*...*a_N}\right]^{\frac{\lambda}{N(1-\lambda)-1}}}\right) - N^2 = SW_1^T.$$

In other words, the maximal level of social welfare achieved under the piece-rate surpasses the maximal level of social welfare achieved under the tournament when $\omega = 1$.

Tournaments are Optimal when $\omega = 0$.

When $\omega = 0$, social welfare is:

$$E[a_i | i\ is\ promoted] - \sum_{i=1}^{N} c(e_i).$$

Social welfare will be higher under the mechanism which generates a higher probability of promoting the highest-ability agent a_1 for a given amount of total cost of effort.

Recall that, for any piece-rate α_0, effort is:

$$e_{i,PR}^{lie} = \log((1-p)\delta\alpha_0) + \log(a_i),$$

so that the probability that agent a_i is promoted is:

$$Pr(a_i\, highest\, output|) \approx \exp\left(-\lambda\left[\frac{1}{N-1}\sum_{j\neq i}\log(a_j) - \log(a_i) + \left(1 + ... + \frac{1}{N-1}\right)\lambda\right]\right).$$

(Note that this probability does not depend on the piece-rate α_0, only on the abilities of the agents in the economy and other parameters.)

On the other hand, under the tournament mechanism, for any bonus B_0, effort is:

$$e_{i,T}^{lie} = \frac{(N-1)}{N(1-\lambda)-1}\log(a_i) - \frac{\lambda}{N(1-\lambda)-1}\sum_{j=1}^{N}\log(a_j) + \log[(1-p)B_0\lambda] + \log E(p,N),$$

so that the probability that agent a_i is promoted is:

$$Pr(a_i\, highest\, output) \approx \exp\left(-\lambda\left[\frac{(N-1)}{N(1-\lambda)-1}\left(\frac{1}{N-1}\sum_{j\neq i}\log(a_j) - \log(a_i)\right) + \left(1 + ... + \frac{1}{N-1}\right)\lambda\right]\right).$$

(Again, note that this probability does not depend on B_0.)

Observe that, because $\frac{1}{N-1}\sum_{j\neq i}\log(a_j) - \log(a_i) < 0$ precisely for the above-average ability agents, and $\frac{1}{N-1}\sum_{j\neq i}\log(a_j) - \log(a_i) > 0$ precisely for the below-average ability agents, it is the case that:

$$Pr(a_i\, promoted)^T > Pr(a_i\, promoted)^{PR}\, for\, a_i > avg(a_i)$$
$$Pr(a_i\, promoted)^T < Pr(a_i\, promoted)^{PR}\, for\, a_i < avg(a_i)$$

Again, note that this is *independent* of the bonus B_0 or the piece-rate α_0—these probabilities only depend on agent abilities (and other exogenously-given parameters). Thus, for every possible piece-rate α_0, there exists a bonus B_0 such that total cost of effort exertion is equalized, but the higher-ability agents have a higher probability of getting promoted, and the lower-ability agents have a lower probability of getting promoted. Hence, the expected ability of the promoted agent is higher under the tournament mechanism than under the piece-rate mechanism given any level of total cost of effort exertion.

Therefore, the maximal level of social welfare achieved under the tournament surpasses the maximal level of social welfare achieved under the piece-rate when $\omega = 0$.

Optimality when $\omega \in (0, 1)$.

Finally, we compare the maximal social welfare achieved under the piece-rate and under the tournament for interior $\omega \in (0, 1)$.

Social welfare given a piece-rate α_ω is:

$$\omega \sum_{i=1}^{N} E[e_{i,lie}^{PR} + \epsilon_i] + (1-\omega)E[a_i | i \text{ } is \text{ } promoted, \text{ } \alpha_\omega] - \sum_{i=1}^{N} c(e_{i,lie}^{PR}),$$

and, given a tournament bonus B_ω, social welfare is:

$$\omega \sum_{i=1}^{N} E[e_{i,lie}^{T} + \epsilon_i] + (1-\omega)E[a_i | i \text{ } is \text{ } promoted, \text{ } B_\omega] - \sum_{i=1}^{N} c(e_{i,lie}^{T}).$$

Crucially, recall that $E[a_i | i \text{ } is \text{ } promoted, \text{ } \alpha_\omega]$ does not depend on α_ω, and $E[a_i | i \text{ } is \text{ } promoted, \text{ } B_\omega]$ does not depend on B_ω: that is, neither the amount of the piece-rate nor the amount of the bonus enters into the expression for the expected ability of the promoted mayor. This is because both the piece-rate and the bonus enter as constants in each agent's equilibrium effort:

$$e_{i,PR}^{lie} = \log((1-p)\delta\alpha_0) + \log(a_i),$$

and:

$$e_{i,T}^{lie} = \frac{(N-1)}{N(1-\lambda)-1} \log(a_i) - \frac{\lambda}{N(1-\lambda)-1} \sum_{j=1}^{N} \log(a_j) + \log[(1-p)B_0\lambda] + \log E(p, N).$$

Thus, the piece-rate and the bonus shift effort levels in a *constant* way across agents of different ability. Hence, the probability that an agent a_i produces the maximal output does not depend on the piece-rate or the bonus—the constant terms cancel each other—and consequently the expected ability of the promoted agent (the agent with highest reported output who is not caught lying) does not depend on the piece-rate or the bonus, either.

This means that the piece-rate $\alpha_\omega$which maximizes social welfare simply maximizes:

$$\omega \sum_{i=1}^{N} E[e_{i,lie}^{PR} + \epsilon_i] - \sum_{i=1}^{N} c(e_{i,lie}^{PR}),$$

while the bonus B_ω which maximizes social welfare simply maximizes:

$$\omega \sum_{i=1}^{N} E[e_{i,lie}^{T} + \epsilon_i] - \sum_{i=1}^{N} c(e_{i,lie}^{T}).$$

The piece-rate α_ω generating maximal social welfare is:

$$\alpha_\omega = \omega\alpha_1 = \frac{\omega}{(1-p)\delta},$$

and the bonus B_ω generating maximal social welfare is:

$$B_\omega = \omega B_1 = \frac{\omega}{(1-p)\lambda E(p,N)} \frac{N}{\sum_{i=1}^{N}\left[\frac{a_i * \ldots * a_i}{a_1 * \ldots * a_N}\right]^{\frac{\lambda}{N(1-\lambda)-1}}}.$$

Hence, the maximal social welfare under the piece-rate is:

$$\omega \sum_{i=1}^{N} \log(a_i) + \omega\frac{N}{\lambda} + \omega N \log\omega + (1-\omega)E[a_i|i \text{ is promoted},\ PR] - \omega N,$$

and the maximal social welfare under the tournament is:

$$\omega \sum_{i=1}^{N} \log(a_i) + \omega\frac{N}{\lambda} + \omega N \log\omega + \omega N \log\left(\frac{N}{\sum_{i=1}^{N}\left[\frac{a_i * \ldots * a_i}{a_1 * \ldots * a_N}\right]^{\frac{\lambda}{N(1-\lambda)-1}}}\right) + (1-\omega)E[a_i|i \text{ is promoted},\ T] - \omega N^2.$$

Then maximal social welfare under the piece-rate surpasses maximal social welfare under the tournament if:

$$\omega\left[\sum_{i=1}^{N}\log(a_i) + \tfrac{N}{\lambda} - N\right] + (1-\omega)E[a_i|i \text{ is promoted},\ PR] >$$
$$\omega\left[\sum_{i=1}^{N}\log(a_i) + \tfrac{N}{\lambda} + N\log\left(\frac{N}{\sum_{i=1}^{N}\left[\frac{a_i * \ldots * a_i}{a_1 * \ldots * a_N}\right]^{\frac{\lambda}{N(1-\lambda)-1}}}\right) - N^2\right] + (1-\omega)E[a_i|i \text{ is promoted},\ T].$$

But we know from the case $\omega = 1$ that this condition is simply:

$$\omega SW_1^{PR} + (1-\omega)E[a_i|i \text{ is promoted},\ PR] > \omega SW_1^{T} + (1-\omega)E[a_i|i \text{ is promoted},\ T].$$

Since we know from the case $\omega = 1$ that $SW_1^{PR} > SW_1^{T}$, and we know from the case $\omega = 0$ that $E[a_i|i \text{ is promoted},\ PR] < E[a_i|i \text{ is promoted},\ T]$, and since the left-hand side and the right-hand side are continuous in ω, it follows by the Intermediate Value Theorem that there exists $\tilde{\omega} \in (0,1)$ such that, when the principal sufficiently values meritocracy ($\omega < \tilde{\omega}$), the tournament is preferred. Otherwise, when $\omega > \tilde{\omega}$, the piece-rate is preferred.

A.3 Proof of Proposition 2 and Corollary 1

Let $\omega = 1$. We know from Proposition 1 that the equilibrium compensation scheme is a piece-rate.

Proposition 2 is straightforward. If the principal values output only for production (not for screening), and the equilibrium compensation scheme to reward the birth-rate is the piece-rate, then we should not expect OCP to impact the probability of promotion (since promotion must be based on something that isn't OCP).

There are two possibilities: either the dimension on which the principal promotes is not related to ability at all, or there is a correlation. Proposition 2 addresses the former case, Corollary 1 the latter.

If the dimension on which the principal promotes is not related to ability, then OCP (which is correlated with ability) should not have an impact on the probability of promotion, and this non-effect should not vary by noisiness or competitiveness of environment.

If the dimension on which the principal promotes is related to ability (but isn't OCP), then if we observe that better OCP performance corresponds with increased probability of promotion, it must be that the non-OCP dimension on which promotion is based is positively correlated with ability.

But then we should observe that better OCP performance has a larger positive effect on the probability of promotion in environments that are more noisy, and the effect should not differ by competitiveness of environment. Why is this?

Recall that in the "all lie" equilibrium, the effort exerted by a_i is (see Appendix A.2):

$$e_{i,PR}^{lie} = \log((1-p)\delta\alpha) + \log(a_i)$$

Note that if $(1-p)\delta < 1$, all agents tell the truth. A necessary condition for agents to lie is therefore $(1-p)\delta > 1$ (probability of detection low enough, scope for lying high enough). This isn't sufficient (we also need F, the disutility from being fired, to not be too negative, and so on), but this is the primary condition.

Then, the principal solves:

$$\max_{\alpha}(1-\alpha)\left(\log[(1-p)\delta\alpha] + \log(a_i) + \frac{1}{\lambda}\right)(1-p).$$

This yields:

$$\alpha^* : 1 - \alpha\left(1 + \frac{1}{\lambda}\right) - \alpha\log[(1-p)\delta\alpha] - \alpha\log(a_i) = 0$$

We then calculate the following important comparative statics:

$$\begin{aligned}
\frac{\partial\alpha^*}{\partial a_i} &= -\frac{\alpha}{a_i}\frac{1}{2 + \frac{1}{\lambda} + \log[(1-p)\delta\alpha a_i]} < 0 \\
\frac{\partial\alpha^*}{\partial\lambda} &= \frac{\alpha\frac{1}{\lambda^2}}{\left[1 + \frac{1}{\lambda} + \log[(1-p)\delta\alpha a_i] + \frac{\alpha_i}{\alpha_i} + \log(a_i)\right]} > 0
\end{aligned}$$

Thus, the incentive strength of the piece rate is lower for higher-ability mayors, and is lower in noisier environments.

To be specific:

1. *OCP performance and promotion*: There is no reason to think that better reported or actual performance on OCP should affect probability of promotion.

   The principal, by assumption in the set up, does not care what the ability of the promoted mayor is. So, if agents are observed to be promoted, it must be on a dimension other than ability. Of course, this dimension may be positively correlated with ability. Thus, since we observe better OCP performance increasing the probability of promotion, if we are in this world, it must be that the principal is promoting based on a dimension that is positively correlated with ability (where higher ability also improves OCP performance).

2. *Noisiness predictions*: If we think that ability is positively correlated with the dimension on which the principal is promoting, then, in this world, this implies that better OCP performance has a *larger* effect (increase) on probability of promotion in environments that are *more noisy*.

   This is because, both in the "all lie" and the "all true" equilibrium:

$$\frac{\partial e_i^{lie}}{\partial a_i} = \frac{1}{a_i}\left[1 - \frac{1}{2 + \frac{1}{\lambda} + \log[(1-p)\delta\alpha a_i]}\right]$$
$$\frac{\partial e_i^{true}}{\partial a_i} = \frac{1}{a_i}\left[1 - \frac{1}{2 + \frac{1}{\lambda} + \log[\alpha a_i]}\right]$$

   But note that both of these expressions are *larger* when $\frac{1}{\lambda}$, the variance of the error, is *larger*. That is, higher ability has a larger positive impact on effort and thus OCP performance when the environment is noisier.

   This contradicts our observation that better OCP performance has a *larger* effect (increase) on probability of promotion in environments that are *less noisy*.

3. *Competition predictions*: In this world, there should be no difference in the effect of decreasing the birth rate on the probability of promotion in more versus less competitive environments, since e_i and the piece rate α depend only on *own* ability, and not the abilities of any other mayor in your region, or on the number of mayors in your region.

   This contradicts our empirical observation that the impact of better OCP performance on the probability of promotion does depend on competitiveness.

A.4 Proof of Proposition 3

Now, suppose ω is small enough—the principal cares sufficiently about the ability of the agent she promotes, and she no longer directly observes ability—so that the principal prefers to use the tournament mechanism (the lower ω is, that is, the more that the principal values output as a screening device to identify the highest-ability mayor, the more likely the principal is to prefer the tournament mechanism).

Then, by introspection, there are potentially three types of pure strategy equilibria:

1. "Pure lie": all the mayors misreport

2. "Pure truth": all the mayors report truthfully

3. "Partial truth": some mayors misreport, and some mayors report truthfully

Again, we focus on the first equilibrium ("pure lie"), since we observe that everyone misreports in the data. (See Appendix A.6 for a discussion of the other equilibrium possibilities, and the sustainability of the "pure lie" equilibrium we focus on.)

Recall that we have already characterized how a given mayor a_i responds optimally depending on the effort exerted by the other $(N-1)$ mayors (in the analysis of Case 1), which we need to characterize the conditions under which each of these types is supported as an equilibrium (if ever).

$$\begin{aligned} e_i(i \text{ lies}, \text{others lie}) &= \frac{(N-1)}{N(1-\lambda)-1}\log(a_i) - \frac{\lambda}{N(1-\lambda)-1}\sum_{j=1}^{N}\log(a_j) \\ &\quad + \log[(1-p)B\lambda] + \log E(p,N) \end{aligned}$$

The principal solves:

$$\max_B \omega \left[\sum_{j=1}^{N}\left(\begin{array}{c} \frac{(N-1)}{N(1-\lambda)-1}\log(a_i) - \frac{\lambda}{N(1-\lambda)-1}\sum_{j=1}^{N}\log(a_j) + \log[(1-p)B\lambda] \\ +\log E(p,N) \end{array}\right)\right]$$
$$+(1-\omega)E[a_i | i \text{ is promoted}] - B.$$

The FOC is:

$$FOC_B : \omega\frac{N}{(1-p)B\lambda}(1-p)\lambda - 1 = 0,$$

since $E[a_i | i \text{ is promoted}]$ does not depend on B. This implies $B^* = \omega N$.

Then, given the bonus B^*, what is the probability that a_i is promoted in this "pure lie" equilibrium, given $e_i(i \text{ lies}, \text{others lie})$?

$$\Pr(a_i \text{ is promoted}, \text{cheating}) = \frac{a_i^{\frac{N-1}{N(1-\lambda)-1}-1}E(p,N)}{\left(\sum_{j=1}^{N}\log a_j\right)^{\frac{\lambda}{N(1-\lambda)-1}}} + p^{N-1}(1-p)$$

Compare this to the probability that a_i is promoted in the model where output is contractible and there is thus no possibility of cheating.

$$\Pr(a_i \text{ is promoted}, \text{no cheating}) = \frac{a_i^{\frac{\lambda}{(1-\lambda)}}\exp\left(-\sum_{j=1}^{N-1}\frac{1}{j}\right)}{\left(\sum_{j=1}^{N}\log a_j\right)^{\frac{\lambda}{N(1-\lambda)}}}$$

(See Appendix A.5 for the analysis of this case when output is contractible and there is thus no cheating.)

Note that the important differences are:

(1) there is an extra element in the "pure lie" probability a_i gets promoted which does not depend on ability at all: $p^{N-1}(1-p)$

(2) there is subsequently less weight in the "pure lie" scenario on the ability term. This is captured by the expected maximal order statistic (because our lying mayor a_i is not always competing against all the other mayors, because some of them will get caught): $E(p,\lambda,N) < \exp(-\lambda\bar{\varepsilon}_{N-1})$.

The main takeaway is that, when output is not contractible and we are in the "pure lie" cheating equilibrium, the probability that any mayor a_i is promoted depends less on her ability a_i than in the no cheating scenario.

This is driven home when we look at:

$$E[a_i|i \text{ is promoted}] = \sum_{j=1}^{N} \Pr(a_i|i \text{ is promoted})a_i.$$

Then:

$$E^{cheat}[a_i|i \text{ is promoted}] = \frac{\sum_{j=1}^{N} a_j^{\frac{N-1}{N(1-\lambda)-1}-1} E(p,N)}{N\left(\sum_{j=1}^{N}\log a_j\right)^{\frac{\lambda}{N(1-\lambda)-1}}} + p^{N-1}(1-p)\sum_{j=1}^{N} a_j$$

$$E^{no\ cheat}[a_i|i \text{ is promoted}] = \frac{\sum_{j=1}^{N} a_j^{\frac{\lambda}{(1-\lambda)}} \exp\left(-\sum_{j=1}^{N-1}\frac{1}{j}\right)}{N\left(\sum_{j=1}^{N}\log a_j\right)^{\frac{\lambda}{N(1-\lambda)}}}$$

This just emphasizes *the key difference in effectiveness of the promotion mechanism at identifying the highest-ability mayor*: in the cheating equilibrium, the expected ability of the promoted mayor includes an extra term which is not present in the benchmark model: $p^{N-1}(1-p)\sum_{j=1}^{N} a_j$. This is the average ability in expectation, which is proportional to the population average:

$$p^{N-1}(1-p)\sum_{j=1}^{N} a_j \propto \frac{1}{N}\sum_{j=1}^{N} a_j.$$

Note that

$$p^{N-1}(1-p) < \frac{1}{N},\ p \in [0,1].$$

The LHS is maximized at $p = \frac{N-1}{N}$ (first order condition is necessary and sufficient since LHS is concave in p as long as $\frac{N-2}{N} < p$, which holds since $p^* = \frac{N-1}{N}$). Then

$$\left(\frac{N-1}{N}\right)^{N-1}\frac{1}{N} < \frac{1}{N},$$

which holds since $\frac{N-1}{N} < 1$.

That is, *the promotion mechanism in the cheating scenario is closer to simply choosing a mayor at random.* Moreover, note that the promotion mechanism performs the worst (most closely resembles random promotion) for intermediate audit probabilities p: if $p = 0$, so people's lies are completely undetectable as long as they stay within δ of their true output, then even though everyone is lying, the highest-ability guys are still exerting the most effort and so their reported lie will still be reasonably likely to be the highest. If $p = 1$, then people are detected for sure if they lie and we are in the truthful equilibrium. *It is when p is low and intermediate that individuals distort the most.*

We find that the following important comparative statics are reflected in our data:

1. Increasing effort increases a_i's probability of promotion:

$$\begin{aligned}\frac{\partial \Pr(a_i \text{ } is \text{ } promoted, cheating)}{\partial e_i} &= \frac{\frac{\partial \Pr(a_i \text{ } is \text{ } promoted, cheating)}{\partial a_i}}{\frac{\partial e_i}{\partial a_i}} \\ &> 0\end{aligned}$$

2. Increasing effort has a larger positive impact on a_i's probability of promotion in less noisy environments (larger λ):

$$\frac{\partial \frac{\partial \Pr(a_i \text{ } is \text{ } promoted, cheating)}{\partial e_i}}{\partial \lambda} > 0$$

3. Increasing effort has a smaller positive impact on a_i's probability of promotion in more competitive environments (larger N):

$$\frac{\partial \frac{\partial \Pr(a_i \text{ } is \text{ } promoted, cheating)}{\partial e_i}}{\partial N} < 0$$

Comparative statics - the details

1. Increasing effort increases a_i's probability of promotion.

   Denote:

$$A(N) \equiv \left[\left(\frac{N-1}{N(1-\lambda)-1} - 1 \right) \sum_{j=1}^{N} \log(a_j) - \frac{\lambda}{N(1-\lambda)-1} \right]$$

$$\begin{aligned}\frac{\partial \Pr(a_i \text{ } is \text{ } promoted, cheating)}{\partial e_i} &= \frac{\frac{\partial \Pr(a_i \text{ } is \text{ } promoted, cheating)}{\partial a_i}}{\frac{\partial e_i}{\partial a_i}} \\ &= \frac{\left(\sum_{j=1}^{N} \log a_j\right)^{\frac{\lambda}{N(1-\lambda)-1}-1} a_j^{\frac{N-1}{N(1-\lambda)-1}-2} E(p,N)A(N)}{\left(\sum_{j=1}^{N} \log a_j\right)^{\frac{2\lambda}{N(1-\lambda)-1}}} \\ &= \frac{a_j^{\frac{N-1}{N(1-\lambda)-1}-2} E(p,N)A(N)}{\left(\sum_{j=1}^{N} \log a_j\right)^{1+\frac{\lambda}{N(1-\lambda)-1}}} \\ &> \frac{a_j^{\frac{N-1}{N(1-\lambda)-1}-2} E(p,N)\left[\frac{(N-1)\lambda}{N(1-\lambda)-1}\right]}{\left(\sum_{j=1}^{N} \log a_j\right)^{1+\frac{\lambda}{N(1-\lambda)-1}}} \\ &> 0\end{aligned}$$

   where the last inequality holds since $A(N) > \frac{(N-1)\lambda}{N(1-\lambda)-1} > 0$. (Recall that $a_i > 1$ for all i, so that $\log(a_i) > 0$ for all i.)

2. Increasing effort has a larger positive impact on a_i's probability of promotion in less noisy

environments (larger λ):

$$\frac{\partial \frac{\partial \Pr(a_i \textit{ is promoted,cheating})}{\partial e_i}}{\partial \lambda} = \frac{a_j^{\frac{N-1}{N(1-\lambda)-1}-2} \log(a_j) \frac{N(N-1)}{[N(1-\lambda)-1]^2} E(p,N)A(N)}{\left(\sum_{j=1}^N \log a_j\right)^{\frac{2\lambda}{N(1-\lambda)-1}}} + $$
$$+ \frac{a_j^{\frac{N-1}{N(1-\lambda)-1}-2} E(p,N) \left[\frac{N(N-1)}{[N(1-\lambda)-1]^2} \sum_{j=1}^N \log a_j - \frac{(N-1)}{[N(1-\lambda)-1]^2}\right]}{\left(\sum_{j=1}^N \log a_j\right)^{\frac{2\lambda}{N(1-\lambda)-1}}}$$

Then this expression is positive since each term is positive:

(a) We know that $A(N) > 0$ from the lower bound established in (1). And, $a_i > 1$ for all i, so that $\log(a_i) > 0$ for all i. Thus, the first term is positive.

(b) $\frac{N(N-1)}{[N(1-\lambda)-1]^2} \sum_{j=1}^N \log a_j - \frac{(N-1)}{[N(1-\lambda)-1]^2} = \frac{(N-1)}{[N(1-\lambda)-1]^2} \left(N \sum_{j=1}^N \log a_j - 1\right) > 0$, so the second term is positive.

3. Increasing effort has a smaller positive impact on a_i's probability of promotion in more competitive environments (larger N).

   There is a question of what ability to assume that the additional $(N+1)st$ mayor has. We characterize an upper bound (below) of the effect of increasing effort on a_i's probability of promotion when competition increases by supposing that $\sum_{j=1}^N \log a_j = \sum_{j=1}^{N+1} \log a_j$ (this is an upper bound because this is the weakest possible way in which competition can increase–the additional mayor is of the lowest ability), and we show that this upper bound is negative.

   Denote $\log \bar{a} = \sum \log a_j$, $\bar{a} = \sum a_j$.

$$\frac{\partial \frac{\partial \Pr(a_i \textit{ is promoted,cheating})}{\partial e_i}}{\partial N} = \frac{-\log \bar{a}^{1+\frac{\lambda}{N(1-\lambda)-1}} a_j^{\frac{N-1}{N(1-\lambda)-1}-2} E(p,N)A(N)}{\log \bar{a}^{2\left(1+\frac{\lambda}{N(1-\lambda)-1}\right)}}$$
$$\times \left[[\log(a_j) - \log(\log(a_j))] \frac{\lambda}{[N(1-\lambda)-1]^2}\right]$$
$$+ \frac{\frac{\partial E(p,N)}{\partial N} a_j^{\frac{N-1}{N(1-\lambda)-1}-2} E(p,N)A(N)}{\log \bar{a}^{2\left(1+\frac{\lambda}{N(1-\lambda)-1}\right)}}$$
$$- \frac{\left(\frac{\lambda}{[N(1-\lambda)-1]^2}\right)(\bar{a}-1)\, a_j^{\frac{N-1}{N(1-\lambda)-1}-2} E(p,N)}{\log \bar{a}^{2\left(1+\frac{\lambda}{N(1-\lambda)-1}\right)}}$$
$$< 0$$

   where the negative relationship holds because each term is negative:

   (a) The first term is negative because $\log(a_j) > \log(\log(a_j))$ ($a_i > 1$ for all i).

   (b) The second term is negative because $\frac{\partial E(p,N)}{\partial N} < 0$: the maximal order statistic for the error is larger in larger samples, so the probability that a given a_i's error draw is weakly larger than the maximal order statistic is smaller in larger samples.

(c) $\bar{a} > 1 \Leftrightarrow \sum a_j > 1$ since $a_i > 1$ for all i.

A.5 Model with Contractible Output (no cheating)

The optimization program is:

$$\max_B \omega E\left[\sum_{i=1}^N y_i\right] + (1-\omega)E[a_i|i \text{ is promoted}] - B \quad s.t.$$
$$e_i \in \arg\max_{\tilde{e}_i} B \Pr(y_i \text{ is } \max|\tilde{e}_i, e_{-i}) - \frac{1}{a_i}\exp(\tilde{e}_i) \quad \forall i \in \{1, ..., N\}$$

We approximate $\Pr(y_i \text{ is } \max|e_1, ..., e_N)$ as in Appendix A.1. Thus, this probability is:

$$\begin{aligned}\Pr(y_i \text{ is } \max|e_1, ..., e_N) &\approx 1 - F_{\exp(\lambda)}\left(\frac{1}{N}\sum_{j=1}^N e_j - e_i + \left(1 + \frac{1}{2} + ... + \frac{1}{N}\right)\frac{1}{\lambda}\right) \\ &= \exp\left(-\lambda\left[\frac{1}{N}\sum_{j=1}^N e_j - e_i + \left(1 + \frac{1}{2} + ... + \frac{1}{N}\right)\frac{1}{\lambda}\right]\right)\end{aligned}$$

We use this to characterize the optimal effort of each agent a_i. Recall $(IC)_i$, the incentive compatibility constraint of agent a_i:

$$\begin{aligned} e_i &\in B\Pr(y_i \text{ is } \max|e_1, ..., e_N) - \frac{1}{a_i}\exp(e_i) \\ FOC_{e_i} &: B\frac{\partial \Pr(y_i \text{ is } \max|e_1, ..., e_N)}{\partial e_i} - \frac{1}{a_i}\exp(e_i) = 0.\end{aligned}$$

The FOC is necessary and sufficient because $c(e_i; a_i)$ is convex in e_i and $\frac{\partial \Pr(y_i \text{ is } \max|e_1,...,e_N)}{\partial e_i}$ is concave in e_i (as will shortly be seen), so strict concavity of the agent's objective function is assured.

Hence, we can characterize the first-order conditions which characterize optimal effort choice by each agent:

$$FOC_{e_i}: \frac{1}{a_i}\exp(e_i) = B\lambda\left(1 - \frac{1}{N}\right)\exp\left(-\lambda\left[\frac{1}{N}\sum_{j=1}^N e_j - e_i + \left(1 + \frac{1}{2} + ... + \frac{1}{N}\right)\frac{1}{\lambda}\right]\right).$$

Taking logs and rearranging yields:

$$FOC_{e_i}: (1-\lambda)\, e_i + \lambda\frac{1}{N}\sum_{j=1}^N e_j = \log(a_i) + \log(B\lambda) + \log\left(1 - \frac{1}{N}\right) - \left(1 + \frac{1}{2} + ... + \frac{1}{N}\right).$$

Sum over all the FOCs:

$$\sum_{j=1}^N e_j^* = \sum_{j=1}^N \log(a_j) + N\log(B\lambda) + N\log\left(1 - \frac{1}{N}\right) - (1 + ... + N).$$

Then use this characterization of total effort to solve for individual effort, using the individual FOC_{e_i}:

$$e_i^* = \frac{1}{(1-\lambda)}\log(a_i) - \frac{\lambda}{(1-\lambda)}\frac{1}{N}\sum_{i=1}^{N}\log(a_i) + \log(B\lambda) + \log\left(1-\frac{1}{N}\right) - \left(1+\frac{1}{2}+...+\frac{1}{N}\right).$$

Then we can use this to solve for the optimal bonus B^* set by the principal:

$$\max_B \omega E\left[\sum_{j=1}^{N} y_j\right] + (1-\omega)E[a_i|i \textit{ is promoted}] - B.$$

But note that $E[a_i|i \textit{ is promoted}]$ does not depend on B: that is, the bonus that the principal sets does not influence the screening quality of the "promote the mayor with the highest output" rule. In other words, a higher bonus B is not *differentially* better or worse than a lower B at screening for ability. The quality of screening (how close $E[a_i|y_i \textit{ is } \max]$ is to a_1, which is the ideal case) depends only on the exogenously-given distribution of the abilities in the economy, $\{a_1, ..., a_N\}$, and how noisy output is given effort. That is, if variance is high (lots of noise), the quality of screening will be lower (because less weight will be placed on a_1 given that y_1 is the maximum output vs. when the principal can be very sure that high effort corresponds to high output (low noise)). This quality depends only on parameters:

$$\begin{aligned} E[a_i|i \textit{ is promoted}] &= \sum_{i=1}^{N} a_i \Pr(i \text{ has max } y_i) \\ &= \sum_{j=1}^{N} a_j \exp\left(-\lambda\left[\frac{1}{(1-\lambda)}\frac{1}{N}\sum_{j=1}^{N}\log(a_j) - \frac{1}{1-\lambda}\log(a_i) + \frac{1}{\lambda}(1+...+\frac{1}{N})\right]\right). \end{aligned}$$

Thus, the principal's problem can be re-expressed as:

$$\max_B \omega E\left[\sum_{i=1}^{N}\log(a_i) + N\log(B\lambda) + N\log\left(1-\frac{1}{N}\right) - (1+...+N)\right] + \omega\frac{N}{\lambda} - B\ .$$

The first-order condition for the principal is:

$$FOC_B : \omega\frac{N}{B} = 1,$$

so that

$$B^*(N,\omega) = \omega N.$$

The equilibrium effort exerted by an agent with ability a_i is:

$$e_i^* = \frac{1}{(1-\lambda)}\log(a_i) - \frac{\lambda}{(1-\lambda)}\frac{1}{N}\sum_{i=1}^{N}\log(a_i) + \log(\omega N) + \log(\lambda) + \log\left(1-\frac{1}{N}\right) - \left(1+\frac{1}{2}+...+\frac{1}{N}\right).$$

Important comparative statics are:

1. The partial derivative of equilibrium effort in ability:

$$\frac{\partial e_i^*}{\partial a_i} = \frac{1}{1-\lambda}\frac{1}{a_i}\left(1 - \frac{\lambda}{N}\right) > 0$$

Essentially, equilibrium effort monotonically increases in ability as long as $\lambda \in (0,1)$ (looking at the expression for e_i^*, one can see that for $\lambda > 1$, the expression for equilibrium effort becomes negative). But recall that we have imposed the parametric assumption $\lambda \in (0,1)$.

2. The partial derivative of equilibrium effort in N (assume that $\frac{1}{N}\sum_{i=1}^{N}\log(a_i) = \frac{1}{N+1}\sum_{i=1}^{N+1}\log(a_i) \equiv \bar{a}$, so that in expectation the $(N+1)st$ agent has average ability–this is the most logical way to analyze the effect of increased competition):

$$\frac{\partial e_i^*}{\partial N} = \frac{1}{2N} + \frac{1}{N(N-1)} + \frac{1}{N^2} > 0$$

Individual effort increases as competition increases.

Note that if we are considering the addition of an $(N+1)st$ agent with a *specific* ability—say, an agent with very high ability—than the lowest-ability agents may decrease their effort in equilibrium, because the average ability rises: $\frac{1}{N+1}\sum_{i=1}^{N+1}\log(a_i) > \frac{1}{N}\sum_{i=1}^{N}\log(a_i)$, and this increase depresses the effort of the lowest-ability agents by the most. It is possible that the added agent has such high ability that all of the original N agents decrease their effort levels. Similarly, if the $(N+1)st$ added agent is known to have very low ability, so low that he lowers the average ability of the new population, and all of the original N agents increase their effort.

3. Individual effort is:

$$e_i^* = \frac{1}{(1-\lambda)}\log(a_i) - \frac{\lambda}{(1-\lambda)}\frac{1}{N}\sum_{i=1}^{N}\log(a_i) + \log(\omega N) + \log(\lambda) + \log\left(1 - \frac{1}{N}\right) - \left(1 + \frac{1}{2} + ... + \frac{1}{N}\right)$$

Then:

$$\begin{aligned}\frac{\partial e_i^*}{\partial \lambda} &= \frac{1}{(1-\lambda)^2}\log(a_i) - \frac{1}{(1-\lambda)^2}\frac{1}{N}\sum_{i=1}^{N}\log(a_i) + \frac{1}{\lambda} \\ &= \frac{1}{(1-\lambda)^2}\left[\log(a_i) - \frac{1}{N}\sum_{i=1}^{N}\log(a_i)\right] + \frac{1}{\lambda}\end{aligned}$$

Higher λ implies lower variance ($V(\varepsilon) = \frac{1}{\lambda^2}$). Thus, for the high-ability agents, that is, those agents who have above average ability, the less variance there is, the more effort they exert. On the other hand, for the low-ability agents, that is, those agents who have substantially below-average ability, the less variance there is, the less effort they exert.

4. Average effort is:

$$
\begin{aligned}
\bar{e} &= \frac{1}{N}\sum_{i=1}^{N} e_i^* \\
&= \frac{1}{N}\sum_{i=1}^{N} \log(a_i) + \log(\omega N) + \log(\lambda) + \log\left(1 - \frac{1}{N}\right) - \left(1 + \frac{1}{2} + ... + \frac{1}{N}\right)
\end{aligned}
$$

Then:

$$
\begin{aligned}
\frac{\partial \bar{e}}{\partial \lambda} &= \frac{1}{\lambda} \\
&> 0
\end{aligned}
$$

Thus, the lower the variance of the noise factor, the higher the average effort exerted in equilibrium.

5. The equilibrium bonus is:

$$B = \omega N$$

It's straightforward to observe that B is increasing in ω and in N.

6. The probability that agent a_i is promoted is:

$$\Pr(i \textit{ is promoted}) = e^{-\lambda\left[\frac{1}{N(1-\lambda)}\sum_{i=1}^{N}\log(a_i) - \frac{1}{(1-\lambda)}\log(a_i) + \left(1+\frac{1}{2}+...+\frac{1}{N}\right)\frac{1}{\lambda}\right]}$$

Then:

$$
\begin{aligned}
\frac{\partial \Pr(i \textit{ is promoted})}{\partial a_i} &= \frac{\lambda}{1-\lambda}\frac{1}{a_i}\left(1 - \frac{1}{N}\right) e^{-\lambda\left[\frac{1}{N(1-\lambda)}\sum_{i=1}^{N}\log(a_i) - \frac{1}{(1-\lambda)}\log(a_i) + \left(1+\frac{1}{2}+...+\frac{1}{N}\right)\frac{1}{\lambda}\right]} \\
&> 0
\end{aligned}
$$

since $N > 1$.

7. The marginal impact of increased effort from agent a_i on the probability that a_i gets promoted is smaller when output is a noisier signal of effort and ability, that is, the variance of the noise factor is high. (The same is true of the average of the marginal impacts.)

Then:

$$
\begin{aligned}
\frac{\partial \frac{\partial \Pr(y_i \ \max | e_i, e_{-i})}{\partial e_i}}{\partial \lambda} &= \frac{\partial \lambda \left(1 - \frac{1}{N}\right) e^{-\lambda\left[\frac{1}{1-\lambda}\frac{1}{N}\sum_{i=1}^{N}\log a_i - \frac{1}{1-\lambda}\log a_i + \left(1+\frac{1}{2}+...+\frac{1}{N}\right)\frac{1}{\lambda}\right]}}{\partial \lambda} \\
&= \left[\left(1 - \frac{1}{N}\right) + \lambda\left(1 - \frac{1}{N}\right)\left(\frac{1}{(1-\lambda)^2}\frac{1}{N}\sum_{i=1}^{N}\log a_i + \frac{1}{(1-\lambda)^2}\log a_i\right)\right] \\
&\times \ \exp\left(-\lambda[...]\right) > 0.
\end{aligned}
$$

Recall that higher λ means *less noise*, since $Var(\varepsilon) = \frac{1}{\lambda}$. Hence, as output becomes a more and more precise signal of effort/ability, the marginal impact of increasing effort on prob. of promotion increases.

In other words, we should observe a gap between actual and target OCP being more predictive of promotion in low-variance vs. high-variance places.

Clearly, this property also holds for the average marginal impact of increasing effort on probability of promotion:

$$\frac{\partial \frac{1}{N}\sum \frac{\partial \Pr(y_i \ \max|e_i,e_{-i})}{\partial e_i}}{\partial \lambda} > 0$$

$$\text{since } \frac{\partial \Pr(y_i \ \max|e_i,e_{-i})}{\partial e_i} > 0 \text{ for each } i$$

8. The marginal impact of increased effort from agent a_i on the probability that a_i gets promoted is smaller when there is more competition. (The same is true of the average of the marginal impacts.)

   Assume that there are N mayors who are candidates for promotion, and we add an $(N+1)^{th}$ mayor. We ask: is the marginal impact of increasing effort on the probability of promotion less for each of the i mayors when there is more competition?

   Assume that the $(N+1)^{th}$ mayor exerts average effort, which is the rational assumption to make ex ante when the ability of the $(N+1)^{th}$ mayor is not known. Thus, $\frac{1}{N}\sum e_i = \frac{1}{N+1}\sum e_{i+1} \equiv \bar{e}$.

$$\frac{\partial \Pr(y_i \ \max|e_i,e_{-i})}{\partial e_i}(N+1) - \frac{\partial \Pr(y_i \ \max|e_i,e_{-i})}{\partial e_i}(N) = \lambda \exp\left(-\lambda\left[\bar{e} - e_i + \left(1+\frac{1}{2}+...+\frac{1}{N}\right)\frac{1}{\lambda}\right]\right)$$
$$\times\left(\exp\left(-\frac{1}{N+1}\right)-1\right) - \frac{\lambda}{N+1}\exp\left(-\lambda\left[\bar{e} - e_i + \left(1+\frac{1}{2}+...+\frac{1}{N}+\frac{1}{N+1}\right)\frac{1}{\lambda}\right]\right)$$
$$+\frac{\lambda}{N}\exp\left(-\lambda\left[\bar{e} - e_i + \left(1+\frac{1}{2}+...+\frac{1}{N}\right)\frac{1}{\lambda}\right]\right)$$
$$< \exp\left(-\lambda\left[\bar{e} - e_i + \left(1+\frac{1}{2}+...+\frac{1}{N}+\frac{1}{N+1}\right)\frac{1}{\lambda}\right]\right)\lambda\left(\left(\exp\left(-\frac{1}{N+1}\right)-1\right)-\frac{1}{N+1}+\frac{1}{N}\right)$$

where the upper bound follows from

$$\exp\left(-\lambda\left[\bar{e} - e_i + \left(1+\frac{1}{2}+...+\frac{1}{N}+\frac{1}{N+1}\right)\frac{1}{\lambda}\right]\right) < \exp\left(-\lambda\left[\bar{e} - e_i + \left(1+\frac{1}{2}+...+\frac{1}{N}\right)\frac{1}{\lambda}\right]\right).$$

But:

$$\exp\left(-\lambda\left[\bar{e} - e_i + \left(1+\frac{1}{2}+...+\frac{1}{N}+\frac{1}{N+1}\right)\frac{1}{\lambda}\right]\right)\lambda\left(\left(\exp\left(-\frac{1}{N+1}\right)-1\right)-\frac{1}{N+1}+\frac{1}{N}\right) =$$
$$\exp\left(-\lambda\left[\bar{e} - e_i + \left(1+\frac{1}{2}+...+\frac{1}{N}+\frac{1}{N+1}\right)\frac{1}{\lambda}\right]\right)\lambda\left(\frac{1}{N(N+1)}+\exp\left(-\frac{1}{N+1}\right)-1\right) < 0$$

since

$$\frac{1}{6}+\exp\left(-\frac{1}{3}\right)-1 \quad < \quad 0: \ (N=2)$$

$$\frac{\partial\left[\frac{1}{N(N+1)}+\exp\left(-\frac{1}{N+1}\right)-1\right]}{\partial N} \quad > \quad 0$$

$$\lim_{N\to\infty}\frac{1}{N(N+1)}+\exp\left(-\frac{1}{N+1}\right)-1 \quad = \quad 0$$

Hence, the more competitive the region, the less predictive better performance in output production should be of promotion.

The same property holds for the average, since it holds for each individual marginal impact.

A.6 Equilibrium Possibilities Other Than "All Lie"

Suppose that a_i anticipates that all the other mayors will lie. What is her expected utility from exerting some effort e_i and reporting truthfully?

In this case, a_i solves:

$$\max_{e_i}\exp\left(-\lambda\left[\frac{1}{N-1}\sum_{j\neq i}\delta e_j-e_i\right]\right)E(p,\lambda,N)B+p^{N-1}B-\frac{1}{a_i}\exp(e_i)$$

Then the first-order condition is:

$$FOC_{e_i}:(1-\lambda)e_i=\log(a_i)+\log(B\lambda)+\log E(p,\lambda,N)-\frac{\lambda}{(N-1)}\sum_{j\neq i}\delta e_j$$

Thus, the equilibrium effort exerted by a_i when she anticipates that the other agents will all exert $\{e_j\}_{j\neq i}$ and misreport, but she tells the truth, is:

$$e_{i\ truth}^{others\ lie}=\frac{1}{1-\lambda}\left[\log(a_i\lambda)+\log(B)+\log(E(p,N))-\frac{\lambda}{N-1}\sum_{j\neq i}\delta e_j\right]$$

Recall that the effort she exerts when she also chooses to misreport is:

$$e_{i\ lie}^{others\ lie}=\frac{1}{1-\lambda}\left[\log(a_i\lambda(1-p))+\log(B)+\log(E(p,N))-\frac{\lambda}{N-1}\sum_{j\neq i}\delta e_j\right]$$

Note that $e_{i\ lie}^{others\ lie}<e_{i\ truth}^{others\ lie}$, since the only difference is the $(1-p)<1$ in the first term of the expression characterizing $a_i's$ effort when she also misreports.

Then, her expected utility when she chooses to be truthful and her expected utility when she also chooses to misreport are described by:

$$EU_{i\ truth}^{others\ lie}=e^{-\frac{\lambda}{1-\lambda}\frac{1}{N-1}\sum_{j\neq i}\delta e_j}a_i^{\frac{\lambda}{1-\lambda}}\lambda^{\frac{\lambda}{1-\lambda}}E(p,N)^{\frac{1}{1-\lambda}}B^{\frac{1}{1-\lambda}}(1-\lambda)+p^{N-1}B$$

$$EU_{i\ lie}^{others\ lie} = e^{-\frac{\lambda}{1-\lambda}\frac{1}{N-1}\sum_{j\neq i} e_j} a_i^{\frac{\lambda}{1-\lambda}} \lambda^{\frac{\lambda}{1-\lambda}} E(p,N)^{\frac{1}{1-\lambda}} B^{\frac{1}{1-\lambda}} (1-\lambda) + (1-p)p^{N-1}B + pF$$

An "all lie" equilibrium is therefore maintained when $EU_{i\ lie}^{others\ lie} > EU_{i\ truth}^{others\ lie}$ for every i:

$$p^N B - pF < \left[(1-p)^{\frac{1}{1-\lambda}} e^{-\frac{\lambda}{1-\lambda}\frac{1}{N-1}\sum_{j\neq i} e_j} - e^{-\frac{\lambda}{1-\lambda}\frac{1}{N-1}\sum_{j\neq i} \delta e_j}\right] a_i^{\frac{\lambda}{1-\lambda}} \lambda^{\frac{\lambda}{1-\lambda}} E(p,N)^{\frac{1}{1-\lambda}} B^{\frac{1}{1-\lambda}} (1-\lambda) \tag{10}$$

When the bracketed term is positive, the right-hand side is increasing in a_i, and the lowest-ability agents are the first to prefer to tell the truth. Thus, an "all lie" equilibrium in that case is maintained when even the lowest-ability agent prefers to tell the truth. When the bracketed term is negative, the right-hand side is decreasing in a_i, and the highest-ability agents are the first to prefer to tell the truth. The bracketed term is more likely to be negative as the probability of detection p increases, and the scope for lying, δ, decreases. The intuition for why the highest-ability agent is the first to prefer to tell the truth in this case is the following: the highest-ability agent is the best at producing output, and so has the best shot at having the highest output even if she reports truthfully. Thus, when probability of detection is high, the highest-ability agent is the first for whom it is not worth the probability of getting caught and fired. And, when the scope for lying is low, the highest-ability agent has even more of a shot at having the highest output when she reports truthfully, since the other misreporting agents can't inflate their reports by very much.

By examining the condition in Equation 10, we infer conditions that make an "all lie" equilibrium more likely. We can easily see that as the probability of detection decreases (p decreases), the bonus B increases, the noise level increases (λ decreases), and F becomes less harsh (recall that F, the disutility from being fired, is negative), the "all lie" equilibrium becomes more likely.

B Data Appendix

B.1 Promotion data

To construct a comprehensive database on the promotion of mayors, we have gone through extensive searches for records of Chinese officials at and above the prefecture level. We first match the name list of mayors with the name lists of the potential positions they could be promoted to. We collected the following complete lists of officials in office during 1985-2000:

1. List of prefecture party secretaries: from *the History of Party Organizations* published by each provincial party office;

2. List of provincial governor or vice-governor, Party secretary or vice-secretary, Party committee member, chairman or vice-chairman of the People's Political Consultative, chairman or vice-chairman of the People's Congress: from *the History of Party Organizations* by province and *Who is Who in China*.

3. List of ministers or vice-ministers of central ministries: from *Who is Who in China*.

The matching algorithm is straightforward. There is no instance where two mayors have the same Chinese name. We use the unique Chinese name and the term year to match. If a mayor's name is matched with the name of an official in any of these higher ranked positions listed above, after his/her term as mayor, he/she is promoted.

We have also searched for resumes of mayors. We double checked the completeness of our matching from their working experiences. If one is not promoted, we learn from the resume where they move to next. Data on the demographic characteristics of mayors are also compiled from their resumes, such as age, gender, education, province and prefecture of birth, etc.

B.2 Measuring birth rate from census data

First, in the 2000 Census, migrants who moved in 1995-2000 reported the prefecture they moved from. We use the information on out-migration and in-migration by prefecture and year in constructing birth rate measures in 1995-2000. We find that ignoring migration leads to underestimation of birth rate in 1995-2000. The average birth rate from 1995-2000 accounting for migration is 4.8 (per 1000 population), while it is 4.3 without considering migration. Second, in 1985-1994 when we do not observe migration by prefecture and year, the migration rate was below 4%. The potential underestimation without accounting for precise migration information would be much lower. Nevertheless, we include a set of controls on migration in these earlier years in our estimation. Specifically, we control for interactions of average migration measures in 1990-1994 and 1985-1990 and time fixed effects. See the details of the measurement below.

Birth rates in 1995-2000 from the 2000 Census

Migration rate in 1995-2000 is relatively high in the period 1985-2000, rising from 4% in 1995 to 11% in 2000. For these five years, we observe the prefecture-by-year migration information in the

2000 Census that we use to construct birth rate. We use the following formula to compute birth rate:

$$Brate_{cpt} = \frac{Births^1_{cpt} + Births^2_{cpt}}{Population_{cpt+1} - (Births^1_{cpt+1} + Births^2_{cpt+1}) + Outmigrants_{cpt+1} - Inmigrants_{cpt+1}}$$

Where c denotes the prefecture, p the province, and t the year. $Brate_{cpt}$ is the ratio of the number of births in prefecture c of province p in year t to the end-of-year population in the same prefecture. In the numerator, $Births^1_{pct}$ is the number of births born in prefecture c in year t who are in prefecture c in 2000, and $Births^2_{pct}$ is number of birth born in prefecture c in year t who moved out of prefecture c. The sum of $Births^1_{pct}$ and $Births^2_{pct}$ is the total number of births born in prefecture c in year t. In the denominator, the end-of-year population in prefecture c in year t is computed by the population in year $t+1$ subtract the number of births in $t+1$, plus migrants who moved out of prefecture c in year $t+1$, and subtract migrants who moved into prefecture c in year $t+1$. $Population_{cpt+1}$ is computed retrospectively. Starting with the number of population in 2000, we compute population in 1999 based on the denominator, and then population in 1998, and so on.

Birth rates in 1990-1994 from the 2000 Census and in 1985-1989 from the 1990 Census

Migration rate before 1995 is below 4%. For 1985-1994, migration information in the census is limited. The 2000 Census did not have the prefecture-by-year migration information for migrants who moved to the current prefecture before 1995, and it is the same for migrants in the 1990 Census. In 1985-1994, we are not able to use the exact migration information in computing birth rate. See the formula for 1985-1994 below:

$$Brate_{cpt} = \frac{Births^1_{cpt}}{Population_{cpt+1} - Births^1_{cpt+1}}.$$

Nevertheless, we use available information from census to control for migration in our estimation. In the 2000 Census, migrants who moved to the current prefecture before 1995 reported the province they moved from. In the 1990 Census, migrants reported the province they moved from since 1985. We construct two sets of aggregate migration measures at the prefecture level:

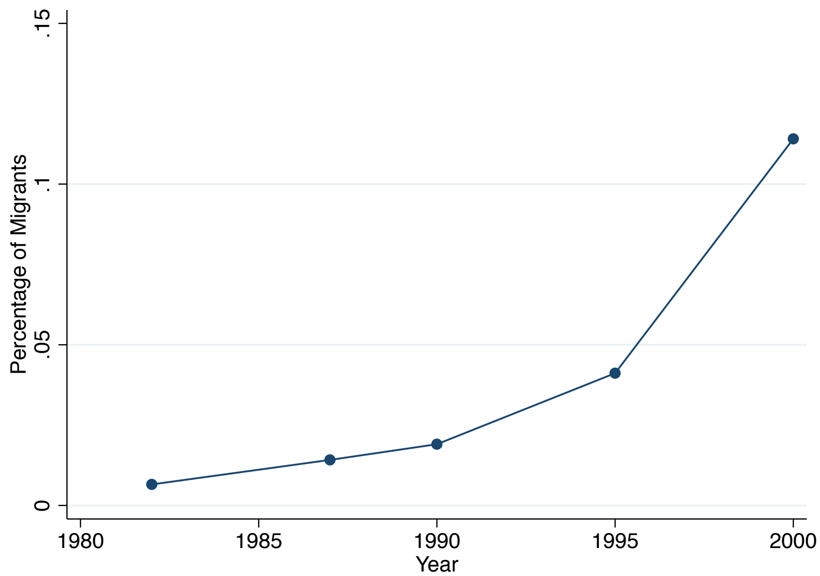
1) The number of out-migrants by the province they moved out in 1990-1994 and in 1985-1989, respectively

2) The number of in-migrants by the current province in 1990-1994 and 1985-1989, respectively

To control for migration in these years, we include interactions of each aggregate measure at the prefecture or province level interacted with time dummy, for example, the number of out-migrants in province p in 1990-1994 interacted with a dummy indicating the time period 1990-1994.

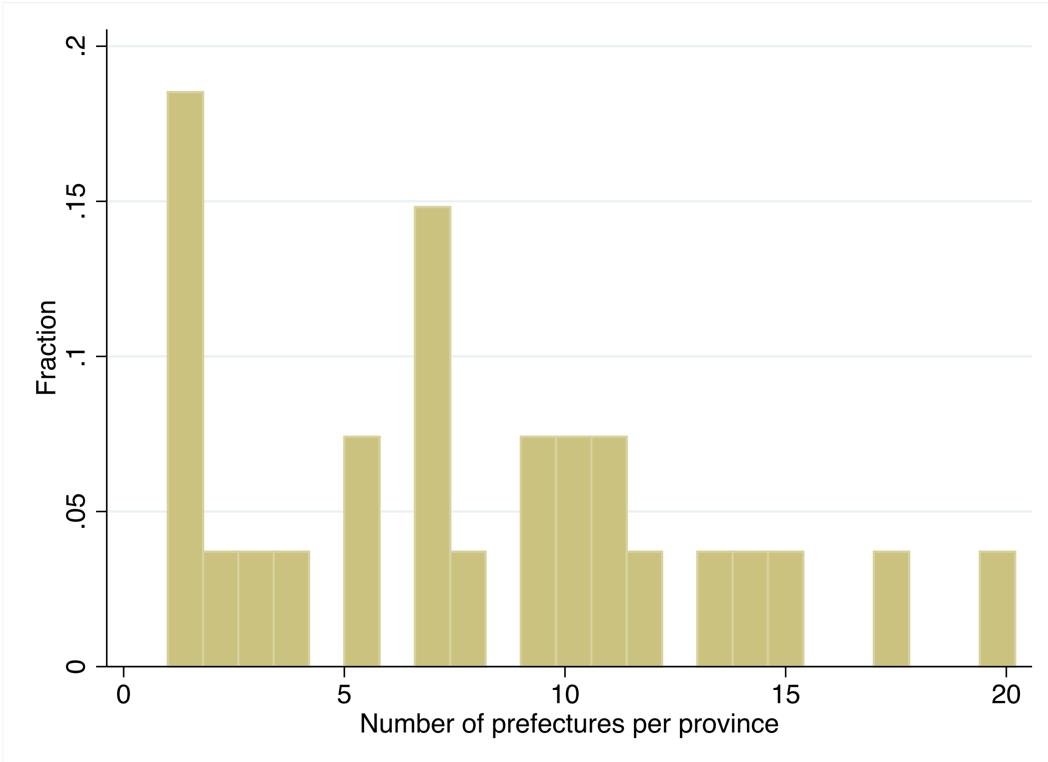
C Additional Figures

Figure A.1: Percentage of Migrants in 1982-2000



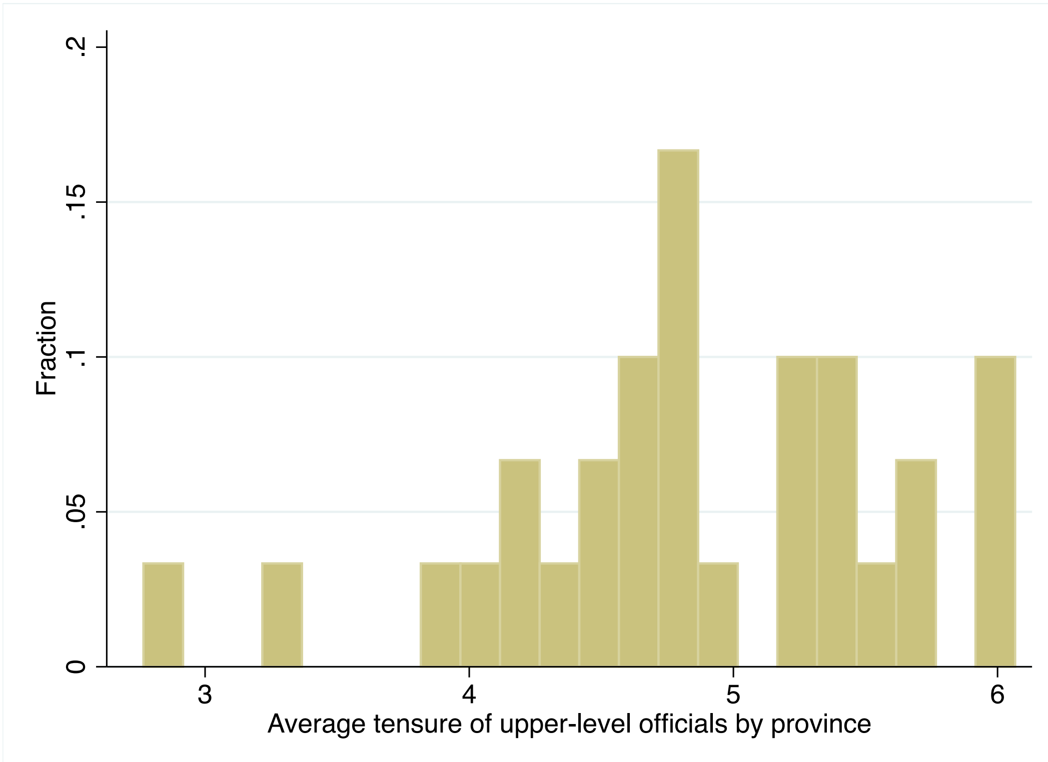
Notes: Data are from population census 1990 and 2000.

Figure A.2: Number of Prefectures Per Province



Notes: Provinces in our mayor data that have 1 prefectures include province-level prefectures (Beijing, Shanghai, Tianjin and Chongqing), and Hainan and Xinjiang province.

Figure A.3: Competitiveness Measure: Average Tenure of Upper-Level Officials



Notes: Data are from digitized term information of all province-level officials ranked higher than mayors. The competitiveness measure is across provinces.

D Additional Tables

Table A.1: Number of Prefectures with Mayor Data and with Birth Rate Data

Year	Number of prefectures	
	(1) Mayor data	(2) Birth rate data
1986	194	151
1987	193	150
1988	207	0
1989	217	162
1990	223	164
1991	221	165
1992	225	164
1993	225	163
1994	229	171
1995	231	174
1996	228	170
1997	240	175
1998	249	177
1999	246	201
2000	210	171

Table A.2: OCP Performance Reported and Promotion: Full Sample

	Promotion = 1			
	(1)	(2)	(3)	(4)
OCP Performance Reported	0.002	-0.000	-0.000	0.000
	(0.003)	(0.004)	(0.004)	(0.004)
Log GDP	-0.011	0.087*	0.087*	0.133**
	(0.010)	(0.050)	(0.050)	(0.059)
Observations	1,972	1,972	1,972	1,972
R^2	0.06	0.52	0.52	0.52
Year FE	Y	Y	Y	Y
Person FE		Y	Y	Y
City FE			Y	Y
Prefecture-year controls				Y

Notes: OCP performance reported is the birth rate target minus the reported birth rate. Tenure fixed effects and migration controls are included in all regressions. Prefecture-year controls include log(population), percentage of urban population and log(government investment). Standard errors are clustered at province-year level. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table A.3: Relation Between Measures of Noise and Competitiveness

	(1) SD Birth Rate	(2) SD Migration	(3) Mean of SDs	(4) Average Tenure	(5) 1-Pr Rate	(6) Mean of Compete
Average Tenure	0.076	0.057	0.067			
	(0.203)	(0.202)	(0.175)			
1-Promotion Rate	0.132	0.189	0.161			
	(0.203)	(0.202)	(0.175)			
SD Birth Rate				0.071	0.058	0.064
				(0.235)	(0.231)	(0.174)
SD Migration				0.047	0.167	0.107
				(0.235)	(0.231)	(0.174)
Observations	27	27	27	27	27	27
R^2	0.03	0.04	0.04	0.01	0.04	0.04

Notes: Mean of Noise is the average of standardized versions of SD Migration and SD Birth Rate. Mean of Compete is the average of standardized versions of Competitiveness (Tenure) and Competitiveness (1-Pr Rate). Please refer to Section 4 for details regarding these measures. This table shows that our measures of Noise and Competitiveness are not statistically related to each other. Each observation is at the province-level. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table A.4: Heterogeneous Effects of OCP Performance by Noise and Competitiveness

	(1) Promotion = 1
OCP Performance Reported	0.018***
	(0.006)
OCP Performance Reported X Noise (Average)	-0.023***
	(0.008)
OCP Performance Reported X Competitiveness (Average)	-0.017**
	(0.007)
Log GDP	0.194***
	(0.071)
Observations	1,593
R^2	0.58
Year FE	Y
Person FE	Y
City FE	Y
Prefecture-year controls	Y

Notes: OCP performance reported is the birth rate target minus the reported birth rate. Noise (Average) is the average of SD Migration and SD Birth Rate. Competitiveness (Average) is the average of Competitiveness (Tenure) and Competitiveness (1-Pr Rate). Tenure fixed effects and migration controls are included in all regressions. Prefecture-year controls include log(population), percentage of urban population and log(government investment). Figure 7c plots marginal effects of increasing OCP performance on the chance on promotion using estimates from this table. Standard errors are clustered at province-year level. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table A.5: Test of IV Identifying Assumptions

Panel A	Stay in position after the change in target = 1	
	(1)	(2)
	Increase in birth rate target	Decrease in birth rate target
OCP Performance Reported	0.013	0.004
	(0.011)	(0.010)
Log GDP	0.039	0.082***
	(0.034)	(0.030)
Observations	338	397
R^2	0.05	0.07

Panel B	Promotion= 1
Future Change in birth rate target	-0.015
	(0.010)
Log GDP	0.158
	(0.098)
Observations	961
R^2	0.60

Panel C	Birth rate from Census - Reported birth rate
Change in birth rate target	0.031
	(0.052)
Log GDP	0.068
	(0.444)
Observations	1,442
R^2	0.66

Notes: OCP performance reported is the birth rate target minus the reported birth rate. OCP performance from census is birth rate target minus birth rate from census data. In Panel A, column (1) uses the subsample in provinces and years with an increase in birth rate target, and column (2) uses the subsample in provinces and years with an decrease in birth rate target. In Panel B, we use the sample of 1986-1995, during which the next change in birth rate target is observed in the data. Tenure fixed effects and migration controls are included in all regressions. Prefecture-year controls include log(population), percentage of urban population and log(government investment). Standard errors are clustered at province-year level. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table A.6: 2SLS Estimates: Heterogeneity by Noisiness

	(1) IV	(2) IV	(3) IV	(4) IV
OCP Performance	0.025*	0.038	0.033**	0.042*
	(0.015)	(0.025)	(0.016)	(0.022)
OCP Performance X Noise (SD Migration)		-0.017		
		(0.017)		
OCP Performance X Noise (SD Birth Rate)			-0.045**	
			(0.020)	
OCP Performance X Noise (Average of Both)				-0.037
				(0.023)
Log GDP	0.163***	0.171***	0.129**	0.158***
	(0.057)	(0.058)	(0.059)	(0.057)
Observations	1,515	1,515	1,515	1,515
R^2	0.576	0.578	0.574	0.579
Mean of Dependent Variable	0.146	0.146	0.146	0.146
Year FE	Y	Y	Y	Y
Person FE	Y	Y	Y	Y
City FE	Y	Y	Y	Y
Prefecture-year controls	Y	Y	Y	Y
Marginal Effect at 25th pctil		.051	.064**	.062*
		(.037)	(.027)	(.033)
Marginal Effect at 50th pctil		.04	.022	.042*
		(.027)	(.014)	(.022)
Marginal Effect at 75th pctil		.019	.008	.019
		(.013)	(.014)	(.013)
One-Sided Test of Interaction (p-val)		0.168	0.014	0.051

Notes: OCP Performance and OCP Performance*Noise (SD Migration) are instrumented with decreases in birth rate target and decreases in target*SD Migration. OCP Performance and OCP Performance*Noise (SD Birth Rate) are instrumented with decreases in birth rate target and decreases in target*SD Birth Rate. OCP Performance and OCP Performance*Noise (Both) are instrumented with decreases in birth rate target and decreases in target*average of two noisiness measures. Tenure fixed effects and migration controls are included in all regressions. Prefecture-year controls include log(population), percentage of urban population and log(government investment). Standard errors are clustered at province-year level. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table A.7: Heterogeneity by Competitiveness

(a) OLS Estimates

	(1)	(2)	(3)	(4)
OCP Performance	0.014**			
	(0.007)			
Log GDP	0.192***	0.191***	0.190***	0.190***
	(0.072)	(0.072)	(0.072)	(0.072)
OCP Performance X Low Competition (Tenure)		0.032***		
		(0.010)		
OCP Performance X High Competition (Tenure)		0.004		
		(0.008)		
OCP Performance X Low Competition (1-Pr Rate)			0.030**	
			(0.013)	
OCP Performance X High Competition (1-Pr Rate)			0.009	
			(0.007)	
OCP Performance X Low Competition (Both)				0.029**
				(0.014)
OCP Performance X High Competition (Both)				0.011
				(0.007)
N	1,593	1,593	1,593	1,593
R^2	0.57	0.57	0.57	0.57
Year FE	Y	Y	Y	Y
Person FE	Y	Y	Y	Y
City FE	Y	Y	Y	Y
Prefecture-year controls	Y	Y	Y	Y

(b) 2SLS Estimates

	(1)	(2)	(3)	(4)
OCP Performance	0.025*			
	(0.015)			
Log GDP	0.163***	0.157***	0.168***	0.162***
	(0.057)	(0.058)	(0.058)	(0.058)
OCP Performance X Low Competition (Tenure)		0.052**		
		(0.026)		
OCP Performance X High Competition (Tenure)		-0.013		
		(0.015)		
OCP Performance X Low Competition (1-Pr Rate)			0.051**	
			(0.024)	
OCP Performance X High Competition (1-Pr Rate)			-0.004	
			(0.013)	
OCP Performance X Low Competition (Both)				0.040**
				(0.019)
OCP Performance X High Competition (Both)				0.001
				(0.018)
N	1,515	1,515	1,515	1,515
Year FE	Y	Y	Y	Y
Person FE	Y	Y	Y	Y
City FE	Y	Y	Y	Y
Prefecture-year controls	Y	Y	Y	Y

Notes: In this table, OCP Performance is interacted with indicator variables for High and Low levels of competition using the tenure, 1-promotion rate, as well as a joint, or "both" measure. Low competitiveness is defined as being in the lowest tercile of the distribution for the tenue and 1-promotion rate measures, while the "both" measure assigns a province to the low competition group if the province qualifies as low competition under either of the two definitions. In each case, we instrument for OCP Performance X Low Competition and OCP Performance X High Competition using interactions of decreases in targets with the indicators for High and Low competition. Tenure fixed effects and migration controls are included in all regressions. Prefecture-year controls include log(population), percentage of urban population and log(government investment). Standard errors are clustered at province-year level. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table A.8: Determinants of the Province-Level Birth Rate Target

	Birth Rate Target (Province-Year)			
	(1)	(2)	(3)	(4)
Ln(Number of Women Aged 15-45)	12.693***	13.946***	12.266***	13.837***
	(3.145)	(3.089)	(3.162)	(3.175)
Fraction of Rural Women		29.275**		28.338**
		(12.035)		(13.313)
Fraction of Women in Ethnic Minority			20.381	3.289
			(18.050)	(19.371)
Observations	107	107	107	107
R^2	0.70	0.73	0.71	0.73
Year FE	Y	Y	Y	Y
Province FE	Y	Y	Y	Y

Notes: Data on the number of women aged 15-45, the fraction of rural women, and the fraction of women in ethnic minority are from 1982, 1990 and 2000 population census. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table A.9: Effects of OCP Performance on Promotion Using Predicted Prefecture-Level Targets

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
OCP Performance	0.013*									
(Province)	(0.007)									
Log GDP	0.186**	0.185**	0.184**	0.183**	0.179**	0.196***	0.186**	0.179**	0.187**	0.183**
	(0.073)	(0.073)	(0.073)	(0.073)	(0.072)	(0.073)	(0.072)	(0.072)	(0.073)	(0.072)
OCP Performance:		0.016*								
0.25*Pref+0.75*Prov		(0.008)								
OCP Performance:			0.018*		0.020**	0.019**	0.021**	0.019**	0.019**	0.020**
0.5*Pref+0.5*Prov			(0.009)		(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
OCP Performance:				0.019*						
0.75*Pref+0.25*Prov				(0.010)						
OCP (Average)					-0.012					
X Noise (SD Births)					(0.010)					
OCP (Average)						-0.022***				
X Noise (SD Migration)						(0.008)				
OCP (Average)							-0.029***			
X Noise (Both)							(0.011)			
OCP (Average)								-0.018***		
X Competition (1-Pr Rate)								(0.007)		
OCP (Average)									-0.015*	
X Competition (Tenure)									(0.009)	
OCP (Average)										-0.026***
X Competition (Both)										(0.009)
Observations	1,593	1,593	1,593	1,593	1,593	1,593	1,593	1,593	1,593	1,593
R^2	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57

Notes: Different measures of OCP performance reported are reported using linear combinations of the province-level target and the constructed prefecture-level target using estimates from Table A.8. Year FE, person FE, city FE, prefecture-year controls and province-year controls are included in all regressions. Tenure fixed effects and migration controls are included in all regressions. Prefecture-year controls include log(population), percentage of urban population and log(investment). We also control for potential determinants of province-level birth rate targets: ln(number of women aged 15-45), fraction of rural women and fraction of women in ethnic minority. Standard errors are clustered at province-year level. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table A.10: 2SLS Estimates of OCP Performance on Promotion: Using Province-Level Targets to Instrument for Prefecture-Level Performance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
OCP Performance(Pref)	0.019**	0.024***	0.021***	0.024***	0.022***	0.019**	0.022***
	(0.008)	(0.008)	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)
Log GDP	0.180***	0.173***	0.189***	0.181***	0.182***	0.175***	0.178***
	(0.056)	(0.056)	(0.056)	(0.056)	(0.056)	(0.055)	(0.055)
OCP(Pref) X Noise (SD Births)		-0.019**					
		(0.009)					
OCP(Pref) X Noise (SD Migration)			-0.020***				
			(0.006)				
OCP(Pref) X Noise (Both)				-0.031***			
				(0.008)			
OCP(Pref) X Competition (Tenure)					-0.016**		
					(0.007)		
OCP(Pref) X Competition (1-Pr Rate)						-0.017***	
						(0.005)	
OCP(Pref) X Competition (Both)							-0.026***
							(0.007)
Observations	1,593	1,593	1,593	1,593	1,593	1,593	1,593
R^2	0.57	0.56	0.57	0.57	0.57	0.57	0.57

Notes: OCP (Pref) is the predicted prefecture-level birth-rate target (using estimates in Table A.8) minus reported birth rate. OCP (Pref) and OCP(Pref)*noisiness/competitiveness measures are instrumented with OCP (Prov) and OCP (Prov)*noisiness/competitiveness measures. Year FE, person FE, city FE, prefecture-year controls and province-year controls are included in all regressions. Tenure fixed effects and migration controls are included in all regressions. Prefecture-year controls include log(population), percentage of urban population and log(investment). We also control for potential determinants of province-level birth rate targets: ln(number of women aged 15-45), fraction of rural women and fraction of women in ethnic minority. Standard errors are clustered at province-year level. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table A.11: 2SLS Estimates of OCP Performance on Promotion: Using Prefecture-Level Targets to Instrument for Province-Level Performance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
OCP Performance(Prov)	0.017**	0.018**	0.017**	0.019**	0.018**	0.018**	0.019***
	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Log GDP	0.185***	0.182***	0.201***	0.188***	0.189***	0.180***	0.185***
	(0.056)	(0.056)	(0.056)	(0.056)	(0.056)	(0.055)	(0.055)
OCP(Prov) X Noise (SD Births)		-0.005					
		(0.009)					
OCP(Prov) X Noise (SD Migration)			-0.020***				
			(0.005)				
OCP(Prov) X Noise (Both)				-0.023***			
				(0.008)			
OCP(Prov) X Competition (Tenure)					-0.013**		
					(0.006)		
OCP(Prov) X Competition (1-Pr Rate)						-0.015***	
						(0.005)	
OCP(Prov) X Competition (Both)							-0.023***
							(0.007)
Observations	1,593	1,593	1,593	1,593	1,593	1,593	1,593
R^2	0.57	0.57	0.57	0.57	0.57	0.57	0.57

Notes: OCP (Prov) and OCP(Prov)*noisiness/competitiveness measures are instrumented with OCP (Pref) and OCP (Pref)*noisiness/competitiveness measures. Year FE, person FE, city FE, prefecture-year controls and province-year controls are included in all regressions. Tenure fixed effects and migration controls are included in all regressions. Prefecture-year controls include log(population), percentage of urban population and log(investment). We also control for potential determinants of province-level birth rate targets: ln(number of women aged 15-45), fraction of rural women and fraction of women in ethnic minority. Standard errors are clustered at province-year level. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table A.12: Spline Specification

	Promotion = 1
	(1)
OCP Performance Reported X Below Target	0.011*
	(0.006)
OCP Performance Reported X Above Target	-0.005
	(0.009)
Log GDP	0.130**
	(0.057)
Observations	1,972
R^2	0.53
Year FE	Y
Person FE	Y
City FE	Y
Prefecture-year controls	Y

Notes: OCP performance reported is the birth rate target minus the reported birth rate. Below target is a binary variable which is 1 if the reported birth rate is below the target and 0 otherwise. Above target is a binary variable which is 1 if the reported birth rate is above the target and 0 otherwise. Above target is also included in the regression. Tenure fixed effects and migration controls are included in all regressions. Prefecture-year controls include log(population), percentage of urban population and log(government investment). Standard errors are clustered at province-year level. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table A.13: Lagged OCP Performance and Promotion

	Promotion = 1			
	(1)	(2)	(3)	(4)
OCP Performance Reported	0.014**	0.014**	0.014**	0.014**
	(0.007)	(0.007)	(0.007)	(0.007)
OCP Performance Reported Lagged 1	0.003	0.003	0.004	0.004
	(0.003)	(0.003)	(0.003)	(0.003)
OCP Performance Reported Lagged 2		0.001	0.001	0.001
		(0.004)	(0.004)	(0.004)
OCP Performance Reported Lagged 3			0.004	0.004
			(0.003)	(0.003)
OCP Performance Reported Lagged 4				-0.001
				(0.003)
Log GDP	0.187**	0.185**	0.187**	0.187**
	(0.073)	(0.073)	(0.073)	(0.073)
Observations	1,592	1,591	1,590	1,590
R^2	0.57	0.57	0.57	0.57
Year FE	Y	Y	Y	Y
Person FE	Y	Y	Y	Y
City FE	Y	Y	Y	Y
Prefecture-year controls	Y	Y	Y	Y

Notes: OCP performance reported is the birth rate target minus the reported birth rate. Tenure fixed effects and migration controls are included in all regressions. Prefecture-year controls include log(population), percentage of urban population and log(government investment). Standard errors are clustered at province-year level. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table A.14: When Migration is Not Fully Considered in OCP Performance and Promotion

	Promotion = 1					
	(1)	(2)	(3)	(4)	(5)	(6)
OCP Performance Census(without migration)	0.004	0.006		-0.002	-0.001	
	(0.006)	(0.006)		(0.005)	(0.005)	
OCP Performance Census (with migration)			0.005			-0.002
			(0.007)			(0.005)
Log GDP	0.150**	0.164**	0.163**	0.118**	0.127**	0.128**
	(0.069)	(0.072)	(0.072)	(0.058)	(0.058)	(0.058)
Observations	1,524	1,483	1,483	1,895	1,832	1,832
R^2	0.58	0.58	0.58	0.53	0.53	0.53
Migration 1985-94*Time FE		Y	Y		Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Person FE	Y	Y	Y	Y	Y	Y
City FE	Y	Y	Y	Y	Y	Y
Prefecture-year controls	Y	Y	Y	Y	Y	Y
Province-year controls	Y	Y	Y	Y	Y	Y

Notes: OCP performance from census is the birth rate target minus the birth rate from census data. Tenure fixed effects and migration controls are included in all regressions. Prefecture-year controls include log(population), percentage of urban population and log(government investment). Standard errors are clustered at province-year level. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table A.15: Robustness of OCP Performance from Census and Promotion

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	IV	IV	IV
OCP Census (Prov)	0.005			-0.000	0.005	
	(0.007)			(0.013)	(0.007)	
OCP Census (Pref)		0.004				0.006
		(0.007)				(0.007)
OCP Census (Average)			0.005			
			(0.007)			
Log GDP	0.155**	0.155**	0.155**	0.139**	0.158***	0.156***
	(0.072)	(0.072)	(0.072)	(0.057)	(0.055)	(0.055)
Observations	1,483	1,483	1,483	1,402	1,479	1,479
R^2	0.58	0.58	0.58			
Instrument				Change in Target	OCP Census (Pref)	OCP Census (Prov)
Year FE	Y	Y	Y	Y	Y	Y
Person FE	Y	Y	Y	Y	Y	Y
City FE	Y	Y	Y	Y	Y	Y
Prefecture-year controls	Y	Y	Y	Y	Y	Y

Notes: OCP Census (Prov) is measured by the province-level birth rate target minus the birth rate from census data. OCP Census (Prov) is measured by the constructed prefecture-level birth rate target minus the birth rate from census data. OCP (Average) is the average of OCP Census (Prov) and OCP Census (Pref). In column (4), OCP Census (Prov) is instrumented with changes in target. In column (5), OCP Census (Prov) is instrumented with OCP Census (Pref), and in column (6), OCP Census (Pref) is instrumented with OCP (Prov). Tenure fixed effects and migration controls are included in all regressions. Prefecture-year controls include log(population), percentage of urban population and log(government investment). Standard errors are clustered at province-year level. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.