The Costs of Bureaucratic Rigidity: Evidence from the Indian Administrative Service*

Marianne Bertrand, Robin Burgess, Arunish Chawla and Guo Xu†

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Abstract

Using a stakeholder survey and rich administrative data we study elite civil servants in India. We find that officers that enter state cadres older and in larger cohorts are less effective and more likely to be suspended. We argue that this is due to weaker promotion prospects and career incentives. We demonstrate that states containing a higher proportion of these officers grow less quickly and that these effects are driven by senior officers and felt most acutely in the organized industrial and service sectors of the economy. Career concerns of bureaucrats therefore affect both their effectiveness and aggregate economic performance. *JEL classification: D73, H11, O10*

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†Marianne Bertrand [University of Chicago Booth School of Business: Marianne.Bertrand@chicagobooth.edu]; Robin Burgess [London School of Economics (LSE) and the International Growth Centre (IGC): r.burgess@lse.ac.uk]; Arunish Chawla [Indian Administrative Service (IAS): arunish.chawla@gmail.com]; Guo Xu [London School of Economics (LSE): g.xu2@lse.ac.uk]

1 Introduction

Bureaucrats are a core element of state capacity. They are responsible for implementing policy and may therefore have a critical bearing on societal outcomes. Bureaucratic effectiveness is particularly important in developing economies. Many have recently adopted economic and social reform programs that are aimed at promoting structural change and have the potential to substantially raise living standards. The eventual success or failure of these programs depends centrally on how they are implemented in the field.

Yet, despite their centrality to development and poverty reduction, the incentives civil servants face within bureaucracies are seldom studied. It is striking, for example, how the study of bureaucrats, and professional bureaucracies in general, has lagged well behind that of politicians or private sector managers. While the influence of political leaders on economic growth (Jones and Olken 2005) and the impact of CEOs on firm performance (Bertrand and Schoar 2003) have been extensively studied, we know very little about how bureaucrats affect the growth and development processes.

This paper tries to address this gap in the literature by studying the elite cadre of civil servants in India - the Indian Administrative Service (IAS). The IAS, often called the "steel frame" of India, is responsible for running all key government departments at the state and federal levels as well as a range of public sector enterprises and corporations.[1] This makes them a particularly interesting set of bureaucrats to study as they oversee the implementation of a range of policies that have the potential to affect aggregate economic outcomes.

A few key features distinguish professional bureaucratic organizations from other organizations: selection through competitive examinations, a virtual absence of discretionary firing (and hence limited exit) and, our focus in this paper, seniority-based progression rules and a fixed retirement age. These rules are a direct response to earlier patronage systems, where appointments and promotions were decided based on personal or political favors.[2] The reliance on objective selection criteria is meant to ensure that the most talented, as opposed to the best connected, are recruited. Once recruited, clear progression rules and limits on discretionary firing are meant to restrict wasteful lobbying or influence activities by agents who seek to affect the principal's decisions (Milgrom 1988). Seniority-based

[1] For much of its post-Independence history India has been a centrally planned economy with IAS officers being responsible for implementing successive five year plans. Post-1991 they were responsible for liberalising the economy and dismantling the planning architecture that had built up since the 1950s (Aghion et al 2008).

[2] The earliest modern bureaucracies go back to the British Northcote-Trevelyan (1854) report which recommended that recruitment into the civil service be by open examination, that the entry age window be between 19 to 25 years, that entrants should be recruited into a unified, permanent civil service and that promotion should be based on merit, not preferment, patronage, purchase or length of service. Many of the recommendations in the report were influenced by the earlier Macaulay reforms in the Indian Civil Service, the predecessor of the modern IAS which was the first of the British civil services to abolish patronage. The Macaulay Report recommended the replacement of the patronage-based system of appointment in the Indian Civil Service by open and competitive examinations (which were made open to Indians), the establishment of a permanent civil service, and an age window for new entrants of 18-25 years. After recruitment, candidates underwent two years of training - one year of formal training in the UK and one year of district training in India - similar to the training structure of the modern IAS (Fulton 1968; Arora and Goyal 1996; Kirk-Greene, 2000). See also Bai and Jia (2016) for a discussion of the Chinese recruitment system for elite civil servants and its impact on political outcomes.

promotion rules also reduce principals' and politicians' ability to engage in favoritism, patronage and corruption by providing objective, impartial criteria for career progression in settings where performance is difficult to measure (Iyer and Mani 2012, Xu 2016).[3] As Weber (1922) notes, "bureaucracy develops more perfectly, the more it is dehumanized, the more completely it succeeds in eliminating from official business love, hatred, and all purely personal, irrational, and emotional elements which escape calculation (p. 975)."

The IAS shares these classic characteristics of modern professional bureaucracies. Selection into the IAS, as for many other civil services around the world, is based on a competitive entry examination, with the top 100-150 scorers on the exam being admitted each year (out of about 450,000 exam takers). Once selected, IAS officers are allocated to a state, also known as a "cadre", through a quasi-random allocation process and officers stay part of the same cadre throughout their career. Promotions within the IAS are subject to tenure-based rules, with promotion waves occurring at 4, 9, 13, 16, 25 and 30 years of service. As Figure 1 shows promotions are based on seniority according to age at entry. Officers do not move to to a higher payscale until the required number of years of experience have been achieved. While the timing of actual promotions closely tracks the promotion grid for junior officers ($<$ 16 years of service), senior officers ($>$ 16 years of service) have to wait beyond the minimum tenure levels to access the top ranks of the bureaucracy.

In the absence of firing and performance pay, career concerns are one of the few sources of incentives for bureaucrats. Promoting bureaucrats predominantly based on seniority can therefore weaken the link between effort and return, blunting a critical source of career incentives. A wide entry age window[4], combined with seniority-based progression and a fixed retirement age (see Figure 2), implies that those who enter older will face barriers to reaching senior payscales (see Figure 3). These limited progression prospects may demotivate officers and reduce their effectiveness.

This is the issue we take up in this paper. We make two contributions. First, we empirically assess whether rigidities in promotion affect IAS officers' on-the-job effectiveness. Second, we examine whether bureaucratic-rule induced variation in the effectiveness of elite civil servants influences the aggregate economic performance of Indian states.

To make progress we must confront the key difficulty associated with studying civil servants – the lack of reliable individual performance measures. Politicians need to win elections and the performance of CEOs may be reflected in sales or stock prices. What the "output" of civil servants is, is much less clear particularly for generalists like IAS officers who work in a variety of departments across their career.[5] We get around this difficulty by polling a group of stakeholders who operate in the same state as an IAS officer and elicit their perception of the effectiveness of that named civil servant. The key stakeholders

[3] Objective performance measures are also confronted with the multi-tasking problem where bureaucrats exert effort only on measurable dimensions (Holmstrom and Milgrom 1991). Rasul and Rogger (2016), for example, show that the introduction of monitoring can result in excessive "box ticking" activities that are detrimental to project completion rates.

[4] 21 to 30 for general candidates, extended to 35 for lower caste candidates.

[5] In our data the average posting length of an IAS officer is 16 months and officers careers typically involve postings in a large variety of departments.

we survey include IAS officers, state civil servants, elected politicians, representatives of business associations, local TV and print media, and civil society organisations. For each IAS officer they know, we ask stakeholders to grade them on a 1 (low) to 5 (high) scale for: effectiveness, probity, the ability to withstand illegitimate political pressures, pro-poor orientation and overall rating. We gather this information in the 14 main states of India and cover the majority of centrally recruited IAS officers in each state.

Figure 4, which is based on these surveys, motivates much of our subsequent analysis. The figure shows the raw relationship between an IAS officer's perceived effectiveness in the stakeholder survey and the officer's age at the time of entry into the IAS. As expected if a lack of promotion prospects is particularly demotivating for officers that enter the service older, we find a negative relationship between officers' perceived effectiveness and their age at enty into the IAS. This negative correlation is robust to controlling for a rich vector of fixed effects and background information derived from the administrative data for each of the IAS officers, such as their gender, rural/urban background, caste affiliation, education, work experience, and scores on the entry exam and training marks.

We also find that officers that enter state cadres older *and* as part of a larger cohort of individuals allocated to the same state cadre in the same year are deemed to be less effective. This, we argue, is because, irrespective of age, officers are considered with members of their entry cohort at each of the promotion stages. An older officer that enters in a relatively small cohort will be encouraged by the fact that they will face few competitors and less delays in reaching the higher echelons of the state bureaucracy. The reverse would be true for an older officer entering in a large cohort. Short-run fluctuations in cohort sizes driven by the number of vacancies in the year of entry, therefore, can have long-lasting impacts on career incentives by locking in officers with a larger or smaller pool of "competitors."

We validate our subjective performance measures by showing that age at entry interacted with cohort size is also positively related to the number of suspensions a given officer has experienced. In addition, holding constant age at entry and cohort size, we find that officers which enter the IAS in cohorts with a higher proportion of younger officers are perceived to be less effective. This is consistent with them being disincentivized by having to compete with officers with longer career spans. Finally, we exploit a natural experiment induced by the 1998 pension reform, which increased the retirement age for IAS officers by two years from 58 to 60. From a career perspective, the reform disproportionately benefited older entrants as these officers became more likely to qualify for senior positions. We find that, after the pension reform, those officers who entered the service older were less likely to be suspended.

We then leverage this core finding that officers that enter the IAS older and in larger cohorts are deemed to be less effective to address the question of whether bureaucratic effectiveness affects state-level economic performance in India. We focus on the 1990-2011 liberalization period when extensive reforms were being implemented and aggregate age at entry and cohort size among serving IAS officers to the state-year level. We argue that, due to the quasi-random manner in which officers are allocated to states at the start of

their careers, age at entry and cohort size at entry are exogenous to contemporaneous state-level economic performance. This empirical set-up enables us to conduct a state-year panel analysis to examine whether having a state cadre which contains a higher fraction of IAS officers which entered older and in larger cohorts adversely affects state-level economic performance.

We find that states containing officers that entered older and in larger cohorts grow less quickly. This is due to effects on the organised industrial and service sectors of the economy which are more dependent on policies controlled by IAS officers. Agriculture, in contrast, which is largely unorganised, is unaffected by the composition of IAS state cadres. Structural change thus appears to proceed more slowly when there is a higher proportion of demotivated, ineffective officers in a state cadre. When we break the cadre into junior officers and senior officers, we find that the effects on economic performance are driven by the latter. This is consistent with the fact that senior officers head up the key government departments in a state and therefore have greatest purchase over policies that might influence state economic performance.

Taken together, we find compelling evidence that the career incentives bureaucrats face influence their effectiveness, and that this has wider impacts on the economic performance of the states over which they have jurisdiction. Our paper thus shines a light on the costs associated with rigid progression rules in public organizations. Given a range of public services from health and education through to the diplomatic services are organized like the IAS, understanding these costs and gaining insights into how bureaucrats might be better motivated represents an important undertaking. Indeed it is central to improving the implementation of public policy, to promoting economic performance and to improving societal outcomes.

The remainder of the paper is organized as follows. Section 2 provides details about the institutional background and introduces our data sources. In Section 3, we test the impact of bureaucratic rigidities on individual performance. Section 4 moves on to investigating the aggregate effects on state-level economic outcomes. We conclude in Section 5.

2 Background and data

2.1 The Indian Administrative Service

The Indian Administrative Service (IAS), the successor of the Indian Civil Service (ICS), is the elite administrative civil service of the Government of India. In 2014 the IAS had an overall strength of around 3,600 centrally recruited officers. These officers are civil service leaders, occupying key positions critical for policy implementation. The most senior civil service positions - the Cabinet Secretary of India, the Chief Secretary of States, heads of all state and federal government departments - are occupied by IAS officers. Senior IAS officers also oversee major state-owned enterprises and state-run corporations. Senior IAS officers are known and publicly visible.

The recruitment of officers is based on performance in the Civil Service Exam, which is

organized annually by the Union Public Service Commission (UPSC). Entry into the IAS is extremely competitive, with several hundred thousand applicants competing for a small number of spots. In 2015, for example, 465,882 UPSC exam takers applied for only 120 IAS slots. The highest performing exam takers are typically offered slots in the IAS. Those who do not qualify for the IAS may obtain positions in less competitive civil service streams such as the Indian Police Service (IPS), the Indian Forest Service (IFS), the Indian Revenue Service (IRS) or the state civil services. There are quotas for the reserved castes, namely the Other Backward Castes (OBC), Scheduled Castes (SC) and Scheduled Tribes (ST).

The age limit for entry into the IAS in our study period lies between 21 and 30 years. This constraint is relaxed for reserved groups, who can enter up to 35 years of age. Once selected, IAS officers are allocated to a state cadre at entry into training. The assignment to a state is typically fixed for life,[6] and officers are attached to their state cadre even when serving in Delhi or abroad. After selection and allocation to the state cadre, IAS officers undergo training at the Lal Bahadur Shastri National Academy of Administration (LBSNAA) and in the states they have been assigned to. The two-year training consists of one year of academic training at the LBSNAA ("course work") and one year of practical training ("district training"). After training, recruits are initially placed in district administration (e.g. as district collectors), and are subsequently promoted to higher level positions. Promotion is seniority based occuring after 4, 9, 13, 16, 25 and 30 years. The discrepancy between minimum and actual tenure required to enter a higher payscale increases for later promotions (Figure 1), which are subject to more stringent performance review and depend on the availability of vacancies (see Appendix Table A1). Finally, retirement occurs at 60 years of age for both male and female officers (58 years before 1998). Figure 2 shows the distribution of age at exit for the set of retired IAS officers. There is very little exit before the designated retirement age – 20% of all officers exit before 58 years of age, and only 8% of officers exit with fewer than 50 years of age.

A wide entry age window, combined with seniority-based progression and a fixed retirement age implies that those who enter older will face barriers to reaching senior payscales (see Figure 3). This may disincentivize effort and lower effectiveness. The potential cost of this bureaucratic rigidity, indeed, has been acknowledged by both the Government of India and the media. The 10th Report of the Administrative Reform Commission, for example, points out that a higher age at entry mechanically implies a "shorter service span, which means [old entrants] may not have adequate opportunities to contribute to policy-making at higher levels".[7] Similarly, media reports frequently point to the disadvantages of combining seniority-based promotion with a fixed retirement age, suggesting that "seniority is an objective basis for promotion but often an ineffective one"[8] and "the problem goes down to the age of entry, since [...] promotions go as much by seniority as merit alone."[9] In line

[6]The only exception which allows for transfers across states is in the case of marriage to another IAS officer. These cases, however, have to be approved on a case-by-case basis and are rare.

[7]Administrative Reform Comission (ARC, 2008), Chapter 5, page 96.

[8]The Indian Express (1 April 2015), "A new kind of babu", by Manish Sabharwal.

[9]The First Post India (22 December 2012), "Quotas: How bias in favour of SC/STs works against them", by R. Jagannathan.

with the recommendations of the Administrative Reform Commission, these media articles call for more flexibility, concluding that the service must "put the best people, irrespective of age, in the right positions", and that "from [an] age-based [retirement] system, we should move to fixed tenures [...] for all civil servants irrespective of joining age"[10]. However, despite repeated calls by these Commissions and other bodies to lower the maximum age at which officers can enter the service,[11] the actual window has been widening over time (see Appendix Figure B1).[12]

2.2 Measuring bureaucrat performance

We collected cross-sectional data on the subjective assessments of IAS officers in the 14 main states of India[13] for 2012-13. IAS officers were assessed on five dimensions: (i) effectiveness on the job, (ii) probity,[14] (iii) ability to withstand illegitimate political pressure, (iv) pro-poor orientation, and (v) overall rating.[15] All dimensions are scored on a 5 point integer scale, where 1 is the lowest and 5 the highest performance.

To obtain assessments from a wide range of stakeholders, we elicited these subjective assessments from respondents of six societal groups in each state: (i) a random sample of IAS officers, (ii) a random sample of state civil servants, (iii) politicians, drawn from a random sample of members of the legislative assembly (MLA), (iv) industry, business and professional associations, comprised of the highest representatives for the major associations,[16] (v) print and TV media, comprised of key journalists covering politics for the largest newspapers and TV stations by circulation and viewership respectively, and finally (vi) civil society, comprised of the highest representatives of major NGOs, trade unions[17] and think-tanks. For each state, we sampled about 10 respondents from each of the groups.[18]

We compiled a list of all centrally recruited IAS officers for each state. In each state,

[10]The Hindu (8 September 2012), "Fixed tenure a way forward on promotions", by Vivek Katju.

[11]See Administrative Reform Commission (2010), p.105.

[12]The age at entry window for the Indian Civil Service (ICS), the colonial precursor of the IAS, was fixed between 21 and 24 years of age just before Independence and geared primarily towards fresh British graduates from Oxford and Cambridge. After Indian Independence this narrow window was maintained into the early 1970s; however, mounting political pressure to include poor and disadvantaged candidates and those from non-elite academic institutions (who it was argued need more preparation time) has pushed the entry window steadily outwards and away from the 19-25 window recommended by Northcote-Trevelyan (1854). The pressure to extend age at entry continues today – the age limit was extended to 32 years for general candidates and 37 years for reserved groups in 2014.

[13]These states are: Andhra Pradesh, Bihar, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal. We excluded joint cadres (Union Territories, Assam - Meghalaya, Manipur - Tripura), as well as the smaller states (Jammu & Kashmir, Nagaland) and the new cadres resulting from state splits in 2000 (Jharkhand, Uttarakhand, Chhattisgarh) from the sample.

[14]Note that a higher value on the scale corresponds to less corruption.

[15]The exact questions are: (i) "How would you rate his/her effectiveness in his/her assignment?" (ii) "How much do you feel this officer uses his/her official position for making money?" (iii) "How much do you feel this officer can withstand illegitimate political pressure?" (iv) "How sensitive is this officer to the needs of the poor and weaker sections in society?" (v) "What is your overall rating of this officer?".

[16]Confederation of Indian Industry (CII), the Federation of Indian Chambers of Commerce and Industry (FICCI), the Associated Chambers of Commerce and Industry of India (ACCI).

[17]All India Trade Union, Secretariat Employees Union.

[18]For logistical reasons, we were unable to survey state civil servants in Gujarat and IAS officers in Punjab.

interviewers then systematically worked through the list, asking respondents to provide assessments for each known candidate. We excluded junior officers with less than 8 years' tenure as they are often in district postings and less visible. Finally, we recorded the source of information to account for reporting biases, differentiating between information obtained through personal exposure, friends or social networks, or the media.

Table 1 provides summary statistics of the 360 degrees[19] measures. The sample sizes range from $N = 15,153$ for the probity measure to $N = 17,753$ for the effectiveness measure. The number of complete assessments across all dimensions is $N = 14,037$. We were able to elicit scores for about 70% of all IAS officers in our sample. All dimensions are correlated, with the highest correlation being between pro-poor orientation and the ability to withstand illegitimate political pressure.

A known concern regarding subjective measures is whether these capture actual information or merely biased perceptions (Prendergast 1998; Olken 2009). Respondents, when providing assessments, may compress ratings around norms or systematically provide positive or negative ratings to all assessed officers ("centrality bias"). In the presence of halo effects, a respondent's overall impression of an officer may also affect the assessments on each of the performance dimensions. Respondents may also base their assessment on public information, such as media reporting, generating an "echo chamber."

We address concerns of reporting biases in three ways. First, we purge respondent-specific biases in measurement. Accounting for level differences in reported effectiveness is important: IAS officers, for example, tend to rate their colleagues more highly, while media representatives provide, on average, more negative ratings (Appendix Table A2). Second, we control for source of information fixed effects to alleviate "echo chamber" biases, namely that those who did not know IAS officers personally merely repeat (potentially biased) perceptions originating in the media. For example, IAS officers known personally by a respondent tend to receive higher effectiveness rating than those rated based on knowledge through media or social networks (Appendix Table A3). Third, we account for interviewer fixed effects to ensure our results are not driven by artifacts of the data collection method. Finally, in Section 3.3.2, we also provide evidence on actual suspensions, a relatively clear-cut objective measure of (non-)performance, to complement the subjective measures.

2.3 Administrative data

To study the determinants of effectiveness, we combine our 360 degree survey data with administrative data obtained from the LBSNAA, the facility where IAS recruits undergo training before their first posting. We use three sources of administrative data.

First, we draw upon the descriptive rolls of 5,635 IAS officers who entered between 1975-2005. This dataset contains a rich set of individual background characteristics ranging from year and location of birth to caste, family background, educational degrees and work experience, allowing us to examine how pre-determined characteristics at point of entry into

[19]The term "360 degree" feedback refers to multi-source feedback used by organizations to elicit information about employees' work-related performance.

IAS correlate with later effectiveness.

Second, we use data on internal rankings[20] which covers 4,107 IAS officers from 1972-2009. This dataset provides information about the initial allocation of officers to cadres, the size of their cohorts in a given entry year, their scores on the entry exam as well as their marks on the training courses.

Finally, on-the-job outcome measures are derived from the executive record sheets of 10,817 IAS officers who entered between 1949-2014. These record sheets contain detailed information about the postings (e.g. job title, department and duration) and payscales of each officer throughout his or her career. This dataset allows us to track suspension episodes for each officer. The data is provided by the Ministry of Personnel, Grievances and Pensions and is publicly available.

Table 2 summarizes the IAS officers' background characteristics for the cross-section of 2012-13, providing a snapshot of the IAS at the time of our survey. The typical IAS officer is about 24.5 years old at the time of entry into the IAS. A large majority of IAS officers are male (86 percent). More than a quarter of IAS officers are drawn from minority castes (OBC = 8 percent; SC = 14 percent; ST = 5 percent). Nearly three quarters of the IAS officers come from an urban background. A large share of IAS officers (32%) had previously obtained tertiary degrees in Science, Technology, Engineering, Mathematics, Statistics (STEM) or Economics. Among those that have worked prior to joining the IAS, a third held public sector jobs.[21] About 3 percent of IAS officers had previously worked in another branch of the All India Services (AIS), such as the Indian Police Service (IPS) or the Indian Forest Service (IFS) before joining the IAS.

Finally, in order to examine the effects of bureaucratic effectiveness on state-level outcomes, we construct a state-year panel covering the 14 Indian states for which we collected survey data. We assemble state-level time series for GDP covering the post-reform period 1990-2011 from data published by the Reserve Bank of India (RBI).[22] To examine, in greater detail, outcomes over which bureaucrats exert control, we use data from the Annual Survey of Industries (ASI). We also use data from the Public Finance Statistics to examine the impact of bureaucrats on revenue generation and spending. Finally, when relevant, we use population data from the decennial Census of India to derive per capita measures.[23]

3 Effects on individual effectiveness

3.1 Age at entry and individual effectiveness

As shown in Figure 1, the IAS is characterized by rigid seniority-based promotion rules. Officers are only promoted to jobs in the top two payscales if they have at least 25 (second highest payscale) or 30 (highest payscale) years of tenure in the IAS. As the figure also

[20] In the IAS, these lists are referred to as the "inter-se-seniority" lists.

[21] The most frequent jobs in this category comprise junior positions in the Indian Railway Service, Income Tax Service, Customs and Telecommunications.

[22] The data is obtained from the RBI's online Data warehouse, available at http://dbie.rbi.org.in.

[23] We (log-)linearly interpolate the annual state-level population between the Census years.

suggests, access to the senior jobs is delayed - likely due to the limited number of vacancies at higher payscales. For example, among officers that have 32 years of tenure in the IAS, essentially all of them are still in the second highest payscale even though they are already eligible for a promotion to the top payscale. Such seniority-based promotion rules, combined with substantial delays in actual promotions and forced retirement at 60 years of age (58 years of age prior to 1998), implies that individuals who enter the IAS at a relatively older age face a mechanical barrier to promotion - they will reach the compulsory retirement age before a job at the highest payscale becomes available for them. In fact, based on the evidence in Figure 3, any individual that enters the IAS above the age of 28 (26 pre 1998) will have almost no chance of getting promoted to the highest payscale.

This suggests that bureaucratic rules may be a first order factor in explaining the negative correlation, observed in Figure 4, between age at entry and effectivenesss. Individuals who enter the IAS at an older age may be less motivated to do well on the job as they do not expect to progress into the top echelons of the bureaucracy, even if they have stellar report cards. This rigid progression rule stands in stark contrast to the private sector, where the practice of fast-tracking high performers is often considered to be "good" management practice (Bloom et al. 2016).

While Figure 4 is consistent with the hypothesis that those who are older at entry are more likely to be disincentivized by the seniority-based progression rule, the obvious threats to this interpretation are omitted variable bias and selection. For example, those entering older may be of differential ability or more likely to come from minority castes. We therefore move beyond the univariate correlation and assess the robustness of the correlation to a battery of officer-specific controls which might be correlated with age at entry. For individual i with k years of tenure rated by respondent j, we estimate the relationship between the perceived effectiveness and age at entry as:

$$score_{ijk} = \alpha \times age\_entry_i + \mathbf{x_i}'\beta + \mathbf{z'_{ij}}\gamma + \tau_k + \theta_j + \varepsilon_{ijk} \quad (1)$$

where $score_{ijk}$ is the subjective rating of officer i (who has k years of tenure) by respondent j, age_entry_i denotes the age at entry and $\mathbf{x_i}$ the vector of officer-specific background characteristics. z_{ij} are source of information dummies that differentiate between knowing the rated officer personally, through networks or through media reports. The coefficients θ_j are respondent fixed effects. As no respondent rates officers in more than one state, these respondent fixed effects also control for any state-specific differences in ratings. The coefficients τ_k are fixed effects for each year of tenure k, which absorb seniority-specific profiles in the ratings. We also include interviewer fixed effects in the vector $\mathbf{x_i}$.[24] Finally, ε_{ijk} is the error term, which is clustered on the respondent level.[25]

We consider four sets of background characteristics in the vector $\mathbf{x_i}$ in addition to age at entry that may have some bearing on how effective bureaucrats are in performing their du-

[24] As interviewers were trained to collect data using one data collection method (face to face, phone or web), the effects also absorb level differences driven by different data collection methods.

[25] Our results are also robust when clustering on the individual IAS officer level.

ties. These include individual socio-economic background characteristics, education, work experience and entry exam and training scores. Individual socio-economic background characteristics include, in addition to age at entry: gender, dummies for the reserved caste (which we know to be mechanically correlated with age at entry due to the higher age eligibility for reserved castes), and a dummy for whether the IAS officer is coming from an urban area. The set of education characteristics include a dummy for a STEM or Economics degree as well as a dummy for having received an academic distinction, as measured by a first-class honours in undergraduate or a distinction in graduate studies (equivalent to a GPA above 3.0). The previous work experience controls include dummies for a prior job in education and research, the private sector, the non-AIS public sector or the AIS (IPS and IFS).[26] The omitted category comprises individuals that entered the IAS without any previous work experience. Finally, we include entry and training scores: the standardized UPSC score, the standardized training score, as well as a dummy $improved_i$ that equals 1 if the officer did better in training than on the entry exam. The UPSC and training scores are standardized within each intake year, thus indicating the relative position of an officer in a given cohort. The dummy $improved_i$ equals 1 if the officer's relative position during training - measured as standard deviations from the mean - improved compared to the UPSC score.

The results are summarized in Table 3. All columns in Table 3 estimate the same regression described in equation (1), except that we vary the dependent variable of interest to span all of the five subjective performance measures considered in our 360 degree survey. To keep the table succinct, we only report the coefficients for the entry exam score which, as a proxy for ability, is likely to be a major confounder of the observed negative relationship. Appendix Table A4 reports the full set of coefficients.

Despite holding constant such a rich set of background controls in this multivariate setting, individuals who enter the IAS at an older age still receive statistically significantly more negative ratings across all dimensions. Note also that the results show robust correlations between the entry exam score and the subjective performance ratings. Officers that obtained higher scores on the entry exam receive stronger evaluations in our 360 degree assessment survey. This is particularly striking as we are examining a highly selected sample of top ranking exam takers.

In summary, while there are multiple reasons beyond the disincentivizing effects of rigid promotion rules that might explain a negative correlation between age at entry and effectiveness, we conclude from Table 3 that the relationship is robust to controlling for other sources of observed heterogeneity between IAS officers. But of course this does not rule out the possibility that the correlation of interest is driven by unobserved sources of heterogeneity. In the following sections, we propose alternative empirical tests that make more direct use of variation in how binding promotion rules are across officers due to the quasi-random assignment of officers to state cadres each year. We also exploit the natural experiment induced by the 1998 pension reform which extended the retirement age by two years and hence mechanically gave officers that entered the service older in affected cohorts

[26]The All India Services comprise the Indian Administrative Service, the Indian Police Service and the Indian Forestry Service which are, in that order of importance, the elite branches of the civil service in India.

a greater chance of reaching the upper echelons of the bureaucracy before retirement.

3.2 Age at entry, cohort size and individual effectiveness

We hypothesize that starting in the IAS older reduces individuals' performance, as rigid promotion rules and a fixed retirement age mechanically means that they have a lower chance of reaching the highest echelons of the bureaucracy. Extending this logic further, being an old entrant in a state cadre cohort that is relatively large (i.e. with many officers in the state that have the same tenure) might be particularly demotivating as a large cohort further reduces the chance of being promoted in any given year. An older officer that enters in a smaller cohort knows that he or she will be one of only very few eligible for promotion when entering the 25th or 30th year in the IAS, and hence their chance of being promoted before having to retire will be higher. In contrast, an older officer that enters in a relatively large cohort should expect more delays and is more likely to be forced into retirement before reaching the top of the bureaucracy. All this suggests an alternative empirical test – there should be a negative correlation between individual effectiveness and the interaction term between the individual's age at entry into the IAS and the size of the state cadre cohort he or she was quasi-randomly allocated to, holding age at entry and cohort size constant. We therefore augment equation (1) by interacting age at entry with the cohort size of the state cadre batch the IAS officer was allocated to:

$$\begin{aligned} score_{ijk} &= \alpha \times age\_entry_i + \beta \times cohort\_size_i + \\ &\quad \gamma \times age\_entry_i \times cohort\_size_i + \\ &\quad \mathbf{x_i}'\delta + \mathbf{z'_{ij}}\eta + \tau_k + \theta_j + \varepsilon_{ijk} \end{aligned} \tag{2}$$

where $cohort\_size_i$ is the number of officers that were assigned to the same cadre in the same year as the officer that is being rated. Cohort size is centered around the sample mean to facilitate interpretation of the results. The other variables are as described in equation (1). In particular, we include the same set of individual background controls as in Table 3.

Our results are presented in Panel A of Table 4. Consistent with the hypothesis that rigid bureaucratic rules might demotivate older entrants, we find that the negative relationship between age at entry and effectiveness is magnified in the presence of larger cohort sizes (Column 1). The interaction term between age at entry and cohort size is also a negative predictor of an officer's overall rating (Column 5). While also negative, the estimated coefficients on this interaction term and the three other subjective assessments (probity, ability to withstand political pressures and pro-poor orientation) are not statistically significant.

The key advantage of this test over that presented in Table 3 is that worries about unobserved correlates of age that might directly affect bureaucratic performance are no longer relevant. However, this specification is not without its own concerns about unobserved heterogeneity. Other individual characteristics may differentially impact an officer's performance in larger versus smaller cohorts. The appeal of this test however compared to that in Table 3 is that introspection does not as easily suggest obvious concerns or threats

to our proposed career incentive-based interpretation.

To address remaining concerns over unobserved confounders that also vary differentially with cohort size, we have replicated the results in Panel B adding a full vector of interaction terms between cohort size and the rich set of individual background characteristics. The estimated effect on the interaction term of interest (age at entry $\times$ cohort size) is nearly unchanged compared to Panel A and remains statistically significant in Columns 1 (effectiveness) and 5 (overall rating).

3.3 Additional evidence

The main threat to the interpretation of our findings as disincentives induced by the rigid seniority-based progression rules remains selection on unobservables. Those who enter older may differ in unobserved characteristics from those who enter young and those characteristics might differentially relate to effectiveness depending on cohort size. Furthermore, while the negative coefficient on age at entry $\times$ cohort size may indeed reflect lower incentives for those who anticipate not being able to climb to the highest echelons, we cannot rule out that older officers perform worse in larger cohorts for other reasons than those related to the rigidity of promotion rules. Finally, some doubts may remain about the quality of our survey-based effectiveness ratings. In this section, we propose three additional tests that help alleviate these remaining concerns.

3.3.1 Cohort age composition and individual effectiveness

In the first additional test, we exploit cross-sectional variation in the age composition of cohorts to which officers are allocated. As is discussed in more detail in Section 4, the allocation of groups of officers to a given state cadre in a given year is a quasi-random process. This means that, holding an officer's age at entry and the size of his or her cohort constant, there will be as good as random variation in the share of officers in the batch that are younger or older than the given officer. This variation can be exploited to assess the impact of the bureaucratic rigidity on effectiveness. Indeed, having many officers in one's cohort that will reach retirement age later than oneself mechanically decreases one's chance of reaching the highest bureaucratic echelons while having many officers in one's cohort that will reach retirement age earlier than oneself mechanically increases one's chance of reaching the highest bureaucratic echelons. Hence, we would expect an officer to perform worse as the number of younger officers in his or her cohort increases. The appeal of this additional test is that it can be implemented by holding constant age at entry as the test only relies on the comparison of relative age among officers in the same cohort.

We use the specification described in equation (1), controlling for the same set of background controls (individual background characteristics, education, previous work experience and entry exam performance), as well as the same set of fixed effects described in Section 3.1. We add two additional independent variables that capture the cadre age composition: the number of younger and older officers in the individual's cadre. Since the variation in the number of younger and older officer relies on the age composition of the cohort, we can

hold constant the individual's age at entry using fixed effects.

The results are presented in Table 5. We find that officers who entered at the same age but have a larger number of younger officers in their cohort are deemed statistically significantly less effective (Column 1), less able to withstand illegitimate political pressure (Column 3) and receive a lower overall rating (Column 5). In contrast, exposure to a larger number of same age or older officers is not associated with differential perceived performance, even though all the point estimates are positive.

3.3.2 Direct measures of performance and longitudinal data

A different potential concern about our results relates to the quality of our 360 degree survey ratings. Yet, while systematic biases might likely exist in the ratings when it comes to background characteristics (e.g. negative views against women or minority castes might translate into negative subjective performance assessment absent evidence for such negative assessments), it is more difficult to think about such systematic biases driving the ratings for a variable such as age at entry × cohort size. In other words, while there might be unfair discrimination against some groups of officers, it is difficult to imagine what would drive systematic negative biases against older officers in larger cohorts.

Nonetheless, we also use suspensions as a direct measure of (non-)performance.[27] Unlike the subjective assessments, suspension data is available for all IAS officers, providing an additional robustness check to alleviate concerns of sample selectivity. In particular, using the publicly available executive record sheets, we can study suspensions for all centrally recruited IAS officers over the period 1980-2012. This is the period for which the executive record sheets cover all IAS officers.

While objective in terms of measurement, we note that this measure also has its own limitations as suspensions may be politically motivated. An officer that is unwilling to countenance the corruption of top state politicians, for example, may be more likely to be suspended. We also note that suspensions are rare events and hence only provide a very crude measure of an officer's effectiveness. In fact, it is our lack of confidence in what these measures are capturing that originally motivated the 360 degree evaluations.

Notwithstanding these caveats, we use the individual-level panel data to run the following regression. For individual i in state s with k years of tenure in year t, we estimate:

$$\begin{aligned} y_{ikst} &= \alpha \times age\_entry_i + \beta \times cohort\_size_i + \\ &\quad \gamma \times age\_entry_i \times cohort\_size_i + \\ &\quad \mathbf{x_i'}\beta + \tau_{\mathbf{t}} + \theta_s + \kappa_k + \varepsilon_{ikst} \end{aligned} \tag{3}$$

The unit of observation in the regression is now the IAS officer i with tenure k in state s and year t. The dependent variable is defined as the cumulative number of suspensions experienced by officer i up to year t. The regression also includes state fixed effects (θ_s),

[27] Appendix Table A6 shows that officers that have been suspended are percieved as less effective and indeed perform worse on all 360 degree performance dimensions.

year fixed effects (τ_t) and year of tenure fixed effects (κ_k). The vector $\mathbf{x_i}$ is the rich set of individual background characteristics from equation (1) when we limit the sample to the subset of observations where we have both information on suspension from the executive record sheets as well as information from the descriptive rolls and internal rankings. The vector $\mathbf{x_i}$ is limited to gender when we extend the analysis to all centrally recruited officers over the period 1980 to 2012, as this is (in addition to age) the only officer-specific background characteristic available in the executive record sheets. Cohort size is again centered around the sample mean for ease of interpretation. Standard errors are clustered at the individual-level to account for the serially correlated nature of the panel data.

The results are presented in Table 6. In Columns 1 to 3, the sample is restricted to officers for which we have descriptive rolls data. The sample more than doubles in Columns 4 to 6 when we include all officers in the executive record sheets. All columns indicate that there is a positive relationship between age at entry and number of suspensions. However, the relationship is only significant (at the 10 percent level) in the full sample (Columns 4 to 6). More importantly, consistent with the results in Panel A of Table 4, we find that the number of suspensions for officers that entered older increases when these officers were assigned to larger cohorts at entry. This pattern is robust to allowing for a richer set of fixed effects that confine the identifying source of variation to variation between IAS officers in the same state and of the same tenure (i.e. fixed effects for each state-tenure year group; Columns 2 and 5). In Columns 3 and 6, we show that this pattern is also robust to allowing for interactions between other individual background characteristics and cohort size (as in Panel B Table 4).

3.3.3 Pension reform and individual effectiveness

Finally, we provide evidence from the 1998 pension reform that relaxed the age at entry constraint as a source of rigidity in progression. In particular, the reform increased the retirement age for IAS officers by two years from 58 to 60 (see Figure 2). While all active IAS officers enjoyed two additional years in service, the pension reform disproportionally benefited those who entered older - under the new retirement schedule, previously age-constrained officers became more likely to qualify for senior promotions. To illustrate this, consider an IAS officer who entered the service at 29 years of age. Before the pension reform, this officer was mechanically barred from qualifying for promotions into the highest payscale which only open up after 30 years in service, since at this point they will have to retire. After the pension reform, however, this mechanical constraint is removed and the officer has one more year before retirement to qualify for the most senior position. Although an officer entering at 21 years of age will also enjoy two more years, the "return" to these two additional years are relatively lower for him or her. More generally, under the view that the negative correlation between individual effectiveness and age at entry captures negative incentives induced by the bureaucratic rigidity, we would expect this negative correlation to be weakened after the pension reform.

We implement this empirical test as a difference-in-differences (DD) regression. For

officer i with tenure k in state s and year t, we estimate the impact of age at entry on the performance outcome y_{ikst} as:

$$\begin{aligned} y_{ikst} &= \alpha \times age\_entry_i + \beta \times age\_entry_i \times post1998_t + \\ &\quad \mathbf{x_i'}\beta + \tau_\mathbf{t} + \theta_s + \kappa_k + \varepsilon_{ikst} \end{aligned} \tag{4}$$

where $post1998_t = 1$ after the pension reform and 0 otherwise. We define the dependent variable as a dummy variable that equals 1 if officer i with tenure k in state s was suspended in year t, and 0 otherwise. We note that for this particular test, suspension is the only available individual performance measure, as our 360 degree survey data is not historically available. The coefficient β captures the differential impact of an additional year of age at entry on the propensity to be suspended after the pension reform in 1998 and is the coefficient of interest. Again, the standard errors are clustered at the individual level to take into account the serially correlated nature of the data.

We estimate this equation on the full panel of IAS officers as in the last three columns of Table 6 covering all centrally recruited IAS officers over the period 1980-2012. We however exclude from the sample all officer-year observations in which the officer is older than 58, the retirement age before the pension reform. This ensures that our results are not contaminated by the fact that officers are mechanically older in the post-pension reform period than in the pre-pension reform period.

The results of this analysis are presented in Table 7 and suggest that the extension of the retirement age by two additional years effectively mitigated the negative impact of age at entry on suspension.

While increasing the age at entry by one additional year is associated with a 0.09 percentage point higher suspension rate, the increase in the propensity of older officers to be suspended disappears after 1998 (Column 1). Column 2 shows that this result is robust to allowing for a richer set of fixed effects that allow the suspension rate to differ systematically across officers from the same state and year of tenure. While decreasing precision, allowing for a differential trended impact of age at entry on suspension (Column 3) and introducing individual fixed effects (Column 4) does not substantially shift the point estimates of the coefficient of interest.

To further assess whether the results in Table 7 are indeed driven by the pension reform, we also estimate a more flexible version of equation (4) where we allow the age at entry coefficient to vary year by year. Figure 5 summarizes the results by plotting the estimated coefficients on age at entry for each year. The figure provides evidence consistent with the view that the diminishing effect of age at entry on suspension coincides with the pension reform. While the impact of age at entry is smoothly trending up over time, we observe a large and discontinuous decrease after the pension reform. Taken together, the evidence in this section is consistent with the view that entering the IAS at an older age reduces individual effectiveness (and increases the probability of suspension) at least in part due to weaker promotion prospects and hence weaker career incentives.

4 Effects on state-level economic performance

What are the implications of having a less motivated group of civil servants for aggregate economic outcomes? This is the question we take on in the final section of the paper. In Section 3.2, we suggested that officers that enter the IAS at an older age might be particularly demotivated when "competing" with a larger group of officers of the same tenure in their state as this reduces their chance of ever reaching the top echelons of the bureaucracy. Because IAS officers run all the key government departments and public sector corporations and enterprises, and are central to the implementation of policy reforms, it is possible that having a higher proportion of such demotivated officers (i.e. older officers in larger batches) in a state cadre may adversely affect economic performance.[28] In a subset of years, we observe age at entry and cohort size for the universe of IAS officers in each state cadre. Combined with data on state-level economic outcome measures, this allows us to assess the empirical relevance of this possibility.

For this state level exercise, we focus on the 1990 to 2011 period, a period of large-scale liberalization reforms. Because the IAS oversees the implementation of these reforms, it is possible that the motivation of its officers is germane to the successful implementation of these reforms and ultimately to the genesis of economic growth (see Weber 1922; Rauch 1995; Rauch and Evans 2000; Dal Bo, Finan and Rossi 2013). As for the 360 degree survey data collection, we focus on the 14 main states in India. Moreover, we again focus on officers with at least eight years of tenure, as they are more likely to be in charge of policy implementation at the state level (rather than at the district level).

The allocation rule for IAS officers is central to our analysis in this section. As indicated previously, the allocation process follows a set of rules that effectively generates a quasi-random allocation of IAS officers across states. The process follows three stages (see the online Appendix for a more detailed description): (i) officers are assigned serial numbers in order of merit, as determined by the civil service exam, (ii) vacancies determine the number of officers needed in each state (i.e. cohort size) and (iii) officers are then allocated to these vacancies by cycling through the list of states. Separate number lines denoting caste status and insider/outsider status are used to match officers to vacancies.[29] The order of states rotates across years, ensuring that all states have their turn at receiving the best talent.

Appendix Table A5 formally tests for the quasi-random allocation of the IAS officers across the 14 main states of India. For this table, the sample of officers is restricted to the group for which we have rich individual background data - those officers we observe in the

[28] As a legacy of central planning and the percieved need of the state to control the commanding heights of the economy, large parts of the economies of Indian states still remain in the public sector and under state control. IAS officers head up important state enterprises (e.g. Bharat Petroleum Limited (Ministry of Petroleum & Natural Gas), Hindusthan Machine Tools (Ministry of Heavy Industries & Public Enterprises) or Indian Rare Earth Limited (Department of Atomic Energy)), run public corporations responsible for infrastructure (e.g. state electricity boards, electricity regulatory commissions, power generation and distribution companies) and oversee state banks and insurance companies (e.g. Industrial Development Bank of India, National Insurance Co. Ltd. (Ministry of Finance)). The influence of IAS officers thus extends beyond government departments and into large swathes of the productive parts of state economies.

[29] Thus while IAS officers can indicate their preference for home state, the quasi-random allocation process ensures that only a small minority of IAS officers are allocated to their home state.

descriptive rolls and internal ranking data. This corresponds to all intake years between 1972 and 2005. We regress individual officers' characteristics on assignment state fixed effects and entry year fixed effects. We then test for the equality of the estimated state fixed effects. The corresponding p-values of the test are presented in Column 1 of Appendix Table A5. Based on our rich set of observable individual characteristics, we cannot statistically reject that states receive, on average, officers that are statistically indistinguishable as regards age at entry, gender, rural/urban background, caste affiliation, education, work experience, scores on the entry exam and training marks.

Of course, due to the relatively small number of officers assigned to a state each year, there will be variation in officer characteristics within states over time, and within intake year across states. Appendix Figure B6 and Appendix Figure B7 show the exam entry score and age at entry of IAS officers allocated to the major states by year of intake. On average, and as formally demonstrated in Appendix Table A5, we see that all states receive officers of the same quality (as proxied for by the exam score) and age at entry. But there is within-state fluctuation around these means. In other words, by chance, a given state may have, for example, a disproportionate share of older officers serving in its senior ranks at a given point in time. This variation is clearly exogenous to state economic outcomes at that point in time. This is true both because of the quasi-random allocation process at entry but also because this allocation process takes place many years before these officers have reached the positions from which they are implement state-level policies.

There is also within-state variation over time in the entry cohort sizes, as is evident from Appendix Figure B8. The year-on-year fluctuation in entry cohort sizes within a state is determined by the number of vacancies that arise in that state and year. While one might argue that this variation might be endogenous to economic conditions in a state at the time of entry, this variation is arguably more exogenous to state economic conditions at the time these cohorts are eight or more years into their tenures.

Our key variable of interest in this analysis, as in the individual data analysis in Section 3.2, is the interaction between the age at entry of serving officers and the size of their cohort. Figure 6 shows this variation across states by intake year. Given the logic above, we argue that this variation is exogenous to state economic conditions, and in particular to state economic conditions by the time the officers in those intake years are eight or more years into their tenures.

Having argued that the allocation of IAS officers to states provides the basis of a credible research design, we now lay out the precise empirical analysis we perform in the state-year panel. Let s denote the state in which officer i is serving at time t. The year of tenure is given by k. The average age at entry of a state cadre s at least eight years into the IAS in year t is:

$$\overline{age\_entry}_{st} = \frac{\Sigma_{\{(i,t)|S=s \wedge k \geq 8\}} age\_entry_i}{\Sigma_{\forall(i,t)} \mathbf{1}[S = s \wedge k \geq 8]} \tag{5}$$

In words, we aggregate the individual-level data to the state-year level by calculating the mean age at entry of all active IAS officers with tenure ≥ 8 in that state and year. We

perform this aggregation for each year between 1990-2011. We use the same aggregation method as described in (5) to compute the average state cohort size in a given state and year, $\overline{cohort}_{st}$. Mirroring the individual level analysis in Section 3.2, the key independent variable of interest in the state-year panel is the interaction between $\overline{cohort}_{st}$ and $\overline{age\_entry}_{st}$.

We note that, in computing these state-year means, we ignore transfers to the central government or leave abroad (e.g. a posting at an international organization or training assignment), which do not affect membership of the state cadre. As secondments to Delhi and leaves are likely to be endogenous to current state economic conditions, we focus on the $(\overline{cohort}_{st})(\overline{age\_entry}_{st})$ variation induced by all state cadre officers irrespective of whether they are present in the state or not. A potential concern, however, lies in the endogenous exit or transfers of IAS officers to other states. If older officers are more likely to exit or transfer when growth is fast, the state-level correlation between age at entry and cohort size may be spurious. Since compliance with the strict retirement age is high and transfers to other state cadres are *de facto* negligible, we argue that this is unlikely to be a major source of bias. We also verified that deviations from the retirement age are not correlated with contemporaneous state-level economic performance.

For state s and time t, we estimate the following reduced form state-level regression:

$$ln(Y)_{st} = \beta_0 \times \overline{age\_entry}_{st} \times \overline{cohort}_{st} + \beta_1 \times \overline{age\_entry_{st}} + \beta_2 \times \overline{cohort}_{st} + \bar{x}'_{st}\gamma + \theta_s + \tau_t + \varepsilon_{st} \tag{6}$$

where the dependent variable Y_{st} is the state-level outcome of interest, and the independent variables, such as $\overline{age\_entry_{st}}$, are constructed as described in (5). Following the standard specification in a growth regression framework, we add state fixed effects θ_s and year fixed effects τ_t. The vector x_{st} controls for the (log) overall state cadre size, which also includes IAS officers below eight years of tenure and recruited from the state civil services, as well as region-specific linear time trends. The standard errors are clustered at the state-level. While we would in practice like to include in $\bar{x}_{st}$ other characteristics of the average IAS officer active in a state in a given year, the only other characteristic available for this state-level analysis is gender. This is because the descriptive rolls and internal ranking data, which contain the rich individual level characteristics, only start with the 1972 intake. Many officers active in the 1990s and even the early 2000s had joined the IAS before 1972.

A key alternative specification we perform in the analysis below separates all active officers with tenure ≥ 8 into senior (at least 16 years of tenure) and junior (8-15 years of tenure). A priori, it is the senior officers that we would expect to have the greater influence on economic outcomes within a state and we can empirically verify that. The key constructs above ($\overline{cohort}_{st}$, $\overline{age\_entry}_{st}$ and their interaction) can be constructed for these two groups of officers using the same aggregation approach as above but appropriately restricting the values of k.

4.1 Effects on GDP

Table 8 reports the impact of average age at entry × average cohort size on state-level GDP per capita. The dependent variable is either total state-level GDP per capita or a sectoral GDP per capita component (agriculture, industry or services). The average cohort size is centered around the sample mean.

We first briefly comment on the estimated coefficient on the direct effect of age at entry. In the individual-level analysis in Section 3.1, we showed that being older at entry was correlated with lower effectiveness. While we argued that this correlation might in part be due to the lower career incentives IAS officers that enter older face due to the bureaucratic rigidity, we also discussed the obvious issues in separating such incentive effects from issues related to selection and omitted variable biases. These interpretational concerns are also present in these state-level regressions as we cannot control for the rich vector of other individual level characteristics as we could in Section 3.1 due to the data constraints discussed above. In particular, a direct effect of average age at entry of active IAS officers on state outcomes may reflect an effect of other average characteristics of the active IAS officers that are correlated with their age. Moreover, even if age at entry is indeed the key characteristic of the IAS officers leading to differential state outcomes, this could be due to selection rather than career concerns induced by the bureaucratic rigidity.

With these caveats, we find that the estimated coefficient on average age at entry is negative across all specifications but statistically insignificant. Focusing on the point estimates, the magnitudes suggest that increasing average age at entry of the state cadre by one year is associated with a 10% reduction in total output per capita (Column 1). While this estimated magnitude appears large, the actual variation in the average age at entry is small. A one standard deviation increase in the average age at entry corresponds to about 0.3 years. Put differently, while the statutory age at entry window increased by 4 years in our sample period of 1990 to 2011, the actual average age at entry only increased by about one year showing that it is difficult to move the average entry age of the state cadre (Appendix Figure B1). Historically for the period 1960-2011, an increase in the maximum age at entry by one year is associated with an increase of the actual average age at entry by 0.16 years.[30] Using a back of the envelope calculation, this elasticity would imply that an increase in the statutory maximum age at entry by one year would be associated with a one-off decrease in state-level GDP per capita by 1.6%.

Of more interest to us is the estimated coefficient on the interaction term between average age at entry and average cohort size, which, as we argued in Section 3.2, puts a sharper spotlight on the bureaucratic rule-induced career concerns that may demotivate older IAS officers. This key interaction term is statistically significant and negative in Column 1, suggesting that the negative impact of average age at entry is magnified in the presence of larger average cohorts. This result mirrors the individual-level results and is consistent with the view that the career incentives of IAS officers have a direct bearing on

[30] This elasticity is estimated by regressing the average actual age at entry on the maximum statutory age at entry for regular entrants and controlling for a linear trend.

the performance of Indian states, affecting the lives of millions of people. The magnitude of this effect is non-trivial. A one standard deviation in average age at entry (0.3 years) reduces overall state-level GDP by about 3.9% when combined with a one standard deviation in average cohort size (2.6).

If IAS officers indeed have a bearing on state-level outcomes, we expect their impact to primarily affect sectors over which the state has purchase (Kocchar et al. 2006). When breaking down the aggregate GDP into its components, we find that the average age at entry $\times$ cohort size only affects the non-agricultural sector (see Columns 3 and 4 in Table 8). The impact is largest on the industrial sector (Column 3). This is perhaps not surprising as the Indian industrial sector is well known for its large organized components, where government policies such as those related to regulation, taxation and public good provision may affect private firms and where state-owned enterprises still play a major role (Basu and Maertens 2007). The service sector is also significantly affected. The impact on agricultural output, however, is statistically indistinguishable from zero (Column 2). We reconcile this pattern using the fact that the bulk of agricultural production in India is subsistence agriculture, which is largely unorganized.

Figure 7 presents visual evidence for the relationship we have uncovered in Table 8. The figure plots the partial correlation between age at entry $\times$ cohort size and state-level outcomes, which are either overall state-level GDP per capita or sector-specific (agriculture, industry, services). We compute the partial correlations, stripping away state and year fixed effects as well as the impact of all other control variables before plotting the remaining correlation. The figure visually confirms that states, in years when serving officers entered older and in larger cohorts, exhibit lower overall GDP and non-agricultural GDP per capita.

Since it is the senior IAS officers who occupy the key positions at the state-level, one may expect the variation in average age at entry $\times$ average cohort size among these IAS officers to matter more. To empirically test this, we replicate the specification in equation (6) but separately compute the state-year aggregates (average age at entry, average cohort size and their interaction, share of female officers) for active officers with 8-15 years of tenure (which we label as junior officers) and for active officers with 16 or more years of tenure (which we label as senior officers). The cut-off at 16 is chosen to reflect the move from junior to "supertime" scale, which is equivalent to senior positions such as Joint Secretaries. This split also corresponds to the median years of tenure.

Panel A of Table 9 reports the results of this analysis. We focus on the two key interaction terms of interest: average age at entry among senior (junior) active officers interacted with average cohort sizes among senior (junior) active officers. The results confirm that the observed negative impact of a higher average age at entry when cohort size increases is indeed driven by the senior IAS officers. In Figure 8, we once again provide the corresponding visual evidence. While the relationship for senior IAS officers is negative, the relationship is flat for junior IAS officers indicating that the effect is coming through senior officers.

4.2 Effects on other economic outcomes

Panels B to D of Table 9 replicate the analysis in Panel A of that Table, probing deeper into various components of state economic performance.

Column 3 of Table 8, as well as Column 3 of Panel A of Table 9, suggest particularly large effects in the industrial sector. In Panel B, we drill into the industrial sector by breaking down its components. We find that officers who are older at entry and in larger cohorts are particularly detrimental for the subset of industries that are dominated by state organizations, and hence under tighter control from the IAS. In particular, we find that variation in the state cadre composition of IAS officers affect the economic performance of the mining and quarrying sector (Column 1), which makes up slightly less than 10% of India's industrial GDP in 2011. This is a sector subject to substantial regulation and licensing requirements, with a large number of public sector undertakings, such as Bharat Industries or the Oil & Natural Gas Corporation, that are under the oversight of ministries such as the Ministry of Mining, Ministry of Coal or the Ministry of Petroleum & Natural Gas. As in Panel A, it is the variation among senior officers that has the largest bearing on outcomes.

The dissection of manufacturing into registered (Column 2) and unregistered (Column 3) sectors corroborates our findings from Section 4.1, whereby IAS officers primarily affected growth through the organized sectors (i.e. not in agriculture). The registered sector includes all firms with more than 10 workers that are officially registered under the Factories Act of 1948, accounting for approximately 70% of the average total state-level manufacturing output in 2011. Consistent with the fact that IAS officers have greater purchase over formal industries (Besley and Burgess 2004, Asher and Novosad 2016), a higher average age at entry and cohort size has a negative bearing on registered manufacturing while having no discernible impact on the unregistered, informal, manufacturing sector. We also find negative impacts on utilities, which comprise electricity, gas and water supply which are often state-run and under the control of senior IAS officers (Column 4).

In Panel C of Table 9, we attempt to validate our findings of impacts on GDP in the formal manufacturing sector with evidence from another independent dataset. We draw on state-level data from the Annual Survey of Industries (ASI) for the same period 1990-2011. The ASI is a census of all registered manufacturing establishments using more than 10 (20) workers when (not) using power. The ASI provides detailed information about production, employment and input costs. The results in Panel C suggest impacts on the expansion of formal manufacturing and employment. States with cadres of higher entry age and cohort size see a slower expansion of industries, as measured by the number of manufacturing establishments (Column 1) and by total employment (Column 2). These are two margins that are subject to tight regulation. Workers in the registered manufacturing sector are covered by the Industrial Disputes Act (IDA) of 1947, which places substantial constraints on the extent to which firms can lay off workers (Besley and Burgess 2004). While statistically insignificant, the point estimate for the impact on net value-added, a proxy for productivity, is negative (Column 3). Finally, the negative impact on industrial

output, as measured by the ASI (Column 4), validates our main state-level result (Table 8). Overall, the evidence from the ASI is consistent with an effective bureaucracy being conducive to state-level industrial growth by facilitating new business creation or existing business expansion (Aghion et al. 2008).

In Panel D of Table 9, we zoom into the service sector to explore channels through which bureaucrats may impact its growth. The results in Panel D show primarily impacts on state-dominated service sectors, consistent with the previous breakdowns by agricultural versus non-agricultural (Table 8) and registered versus unregistered manufacturing (Panel B). We find significant impacts on the segment of the sector encompassing transport, storage and communications (Column 2), which make up about 11% of the service sector in 2011, the bulk of which is attributable to economic activity in railways and road transportation. There is also a large impact on the banking and insurance sub-sector (Column 4), which - despite deregulation - remains dominated by state owned banks. Again, in both cases, the effect is driven by more senior officers. In contrast, there is no statistically significant impact on retail trade, hotels and restaurants (Column 3) and construction (Column 1) which, in India, are largely unorganised.

Overall, the state-level results paint a robust and coherent picture of how variation in the motivation of bureaucrat cadres, as induced by bureaucratic rigidity, can impact economic outcomes at the state-level. The breakdown by dimensions such as junior versus senior, as well as the disaggregation by sectors, provides evidence consistent with senior officers exerting disproportionate control, and having disproportionate impact, over regulated sectors of the economy.

In the remaining two panels of Table 9, we conclude this state-level analysis by examining potential impacts on public expenditures (Panel E) and public revenue (Panel F), two key dimensions of state capacity (Besley and Persson 2009). A less motivated group of senior bureaucrats may negatively impact economic outcomes at the state level by doing less, which would translate in lower public spending (e.g. new schemes are not being implemented, or are slow in being implemented) and lower revenue. In Panel E, we consider possible impacts on total public expenditures (Column 1) but also isolate social and economic expenditures. Social expenditures comprise spending on education, health and welfare, while economic expenditures comprise spending on rural development, special area programmes, energy, industry, transport and communications. Consistent with the GDP analysis, we find that age at entry $\times$ cohort size has negative impacts on total public expenditures (Column 1), and that the effect appears particularly large for economic expenditures, which might be particularly conducive to industrial growth (Column 3). Again, it is the composition of the senior segment of the bureaucracy that appears to matter. In Column 4 of Panel E, we examine whether the number of large scale development projects, as measured by the number of World Bank funded projects, is also affected. While of the expected sign (negative), the estimated coefficient is not statistically significant.

Finally, Panel F of Table 9 suggests that state cadres with a higher average age at entry and larger average cohort size are also associated with lower revenue generation. The effect

is primarily driven by lower tax revenue, either coming straight from state taxes (Column 2) or obtained from taxes levied by central government (Column 3). Again the effects are driven by senior officers who occupy leadership positions in the government departments responsible for collecting both state and central taxes in the Indian states.

5 Conclusion

The organization of the state is attracting increasing attention within economics as a central determinant of economic performance (Besley and Persson 2009, Finan et al 2015). Bureaucrats and bureaucracies are considered to be the backbone of the modern state but have been little studied. A recent wave of papers that has studied selection and incentives of public servants has tended to focus on lower level bureaucrats and frontline providers (Ashraf et al. 2016, Dal Bo et al 2013, Deseranno 2016, Khan et al. 2015, Nath 2016, Gulzar and Pasquale 2016, Rasul and Rogger 2016). This contrasts with an older literature that sees bureaucrats and bureaucracies as central to the industrialization and growth processes (Northcote and Trevelyan 1854, Weber 1922, Tullock 1965, Rauch 1995, Rauch and Evans 2000).

Our paper fits between these two literatures by studying the Indian Administrative Service. IAS officers hold positions at the apex of government that grant them significant influence over the implementation of policies, rules and regulations that may affect growth in a country of over a billion people. How well incentivized or motivated they are may have far ranging effects as their effort and actions affect not only the actions of subordinates but also, via policy, the actions of individuals, households and firms which jointly determine economic growth.

By fielding a large-scale survey in fourteen states in 2012-13 we were able to open the black box of what determines bureaucratic effectiveness. Our individual-level results, which leverage several empirical strategies, suggest that the combination of seniority based promotion rules and a fixed retirement age reduce bureaucrats' effectiveness by dimming promotion prospects and weakening career incentives. In a state-year panel, we find that state cadres containing a higher proportion of officers who entered older and in larger cohorts, and for whom the combination of seniority based promotion rules and a fixed retirement age might be particularly demotivating, experience worse economic outcomes. Moreover, these effects are driven by the impact on industry and services which are the more organized sectors in India and therefore more likely to be affected by policies controlled by IAS officers. We also show that it is the senior IAS officers that appear responsible for these effects.

Overall, our paper sheds light on some of the costs associated with the rigid rules that govern bureaucracies such as the IAS. However, our paper does not answer the broader question as to whether the top Indian civil service would be more effective if freed of these rules. Indeed, it is possible that a first-order reduction in patronage, favoritism and influence activities, that a bureaucratic system is meant to confront, dominate what might only be the second-order costs highlighted in our study. This broader question is beyond the scope

of our paper. However, by isolating costs, our study certainly calls for further work on trying to isolate those potential benefits.[31] Only then would one be able to engage in a robust policy discussion about possible better ways to organize an elite civil service such as the IAS.

More humbly, our study does suggest that some more marginal, and politically realistic, changes in the organization of the IAS might be beneficial. In particular, our study provides empirical support for the concern raised by the Administrative Reform Commission (ARC, 2008) about the rising maximum eligible age at entry into the IAS. Our study also suggests that a reform that would move away from an age-based retirement system towards a system with fixed tenures for all civil servants irrespective of joining age should be seriously considered.

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Table 1: Descriptive statistics of 360 performance measures

	(1) Mean	(2) SD	(3) Ratings	(4) Officers	(5) Coverage
Effectiveness on the job	3.730	1.077	17,753	1,472	71.14%
Probity of IAS officer	3.670	1.105	15,153	1,451	70.13%
Withstanding illegitimate pressure	3.523	1.094	16,728	1,471	71.09%
Sensitive towards poorer	3.527	1.141	17,047	1,471	71.09%
Overall rating	3.646	1.057	17,698	1,472	71.14%

Notes: Performance scores for the cross-section of rated IAS officers in 2012-13. Reporting the descriptive statistics (mean and standard deviation) for the subjective measures, where the scores range from 1 (lowest) to 5 (highest). Column 3 and 4 report the total number of ratings and the total number of rated officers. Column 5 reports the coverage rate for the sample population of all active, centrally recruited IAS officers with at least 8 years of tenure in 2012/13.

Table 2: Individual characteristics of IAS officers in 2012

	(1)	(2)	(3)	(4)	(5)	(6)
			Percentile			
	Mean	SD	10%	50%	90%	Obs.
Age at entry	24.474	2.088	22	24	27	1,472
Female	0.141	0.349	0	0	1	1,472
Other backward caste (OBC)	0.081	0.273	0	0	0	1,472
Scheduled caste (SC)	0.141	0.349	0	0	1	1,472
Scheduled tribe (ST)	0.052	0.222	0	0	0	1,472
Urban background	0.737	0.439	0	1	1	1,472
Academic distinction	0.326	0.468	0	0	1	1,472
STEM or Economics degree	0.324	0.468	0	0	1	1,472
Previous job: Education/research	0.168	0.374	0	0	1	1,472
Previous job: Private/SOE	0.121	0.326	0	0	1	1,472
Previous job: Public sector	0.324	0.468	0	0	1	1,472
Previous job: Public AIS	0.033	0.181	0	0	0	1,472
Ranking in year of intake	53.896	35.549	10	49	104	1,472
Cohort size	7.334	3.971	3	7	12	1,472

Notes: Mean, standard deviation and percentiles of IAS officers in 2012-13. Sample covers the cross-section of centrally recruited IAS officers in 2012-13 with performance ratings. Urban background denotes officers from urban backgrounds, Academic distinction is a dummy for having received an academic distinction. STEM is a dummy for graduates of Science, Technology, Engineering and Mathematics and Economics degrees. Previous job denotes the sector of employment previous to entry into IAS (Education/research, Private sector/State-owned-enterprise, Public sector-Non All India Service, Public sector-All India Service). Ranking is the rank of the officer among all who entered in a given year based on the entry and training scores. Cohort size is the number of IAS officers allocated to the same state in a given year.

Table 3: Age at entry and effectiveness

	(1) Effective	(2) Probity	(3) Pressure	(4) Pro-Poor	(5) Overall
Mean of dep. var	3.730	3.671	3.524	3.528	3.647
Age at entry	-0.009**	-0.009**	-0.015***	-0.007*	-0.010**
	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)
Entry score	0.041***	0.021	0.023**	0.021*	0.041***
	(0.010)	(0.013)	(0.011)	(0.012)	(0.010)
Background controls	Yes	Yes	Yes	Yes	Yes
Interviewer FEs	Yes	Yes	Yes	Yes	Yes
State-specific respondent FEs	Yes	Yes	Yes	Yes	Yes
Tenure year FEs	Yes	Yes	Yes	Yes	Yes
Source of information FEs	Yes	Yes	Yes	Yes	Yes
Observations	17,750	15,138	16,719	17,043	17,695

Notes: Unit of observation is the score for a given IAS officer in 2012-13 with at least 8 years of tenure. Relating the five performance measures (effectiveness, probity, ability to withstand illegitimate political pressure, pro-poor orientedness and overall rating) to age at entry. Entry score is the standardized UPSC score in the year of intake with a mean of 0 and a standard deviation (SD) of 1. Background controls are: a female dummy, caste dummies (OBC, SC, ST), a dummy for coming from an urban background, having received an academic distinction, a STEM or Economics degree, having worked in education/research, private sector/SOEs, public sector, public AIS, a standardized training score, as well as a dummy that is 1 if the officer improved the ranking in the training relative to the entry exam. The summary statistics of the background controls are shown in Table 2. Interviewer FEs are dummies for each interviewer. State-specific respondent FEs are fixed effects for each respondent. Tenure year FEs are dummies for each year since entering the IAS. Source of information FEs are dummies for whether the respondent knows the officer personally, through friends or only through media. Robust standard errors in parentheses, clustered at the respondent level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 4: Age at entry, cohort size and effectiveness

Panel A	(1)	(2)	(3)	(4)	(5)
	Effective	Probity	Pressure	Pro-Poor	Overall
Mean of dep. var	3.730	3.671	3.524	3.528	3.647
Age at entry	-0.013***	-0.012**	-0.017***	-0.008*	-0.014***
	(0.005)	(0.006)	(0.005)	(0.004)	(0.005)
Cohort size (centered)	0.064**	0.047	0.044	0.027	0.075**
	(0.028)	(0.033)	(0.031)	(0.029)	(0.029)
Age at entry × Cohort size	-0.003**	-0.002	-0.002	-0.001	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Interviewer FEs	Yes	Yes	Yes	Yes	Yes
State-specific respondent FEs	Yes	Yes	Yes	Yes	Yes
Tenure year FEs	Yes	Yes	Yes	Yes	Yes
Source of information FEs	Yes	Yes	Yes	Yes	Yes
Background controls	Yes	Yes	Yes	Yes	Yes
Observations	17,750	15,138	16,719	17,043	17,695
Panel B	Effective	Probity	Pressure	Pro-Poor	Overall
Mean of dep. var	3.730	3.671	3.524	3.528	3.647
Age at entry	-0.012***	-0.012**	-0.016***	-0.009**	-0.014***
	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)
Cohort size (centered)	0.066**	0.041	0.030	0.048	0.073**
	(0.029)	(0.035)	(0.032)	(0.031)	(0.034)
Age at entry × Cohort size	-0.003**	-0.001	-0.001	-0.002	-0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Interviewer FEs	Yes	Yes	Yes	Yes	Yes
State-specific respondent FEs	Yes	Yes	Yes	Yes	Yes
Tenure year FEs	Yes	Yes	Yes	Yes	Yes
Source of information FEs	Yes	Yes	Yes	Yes	Yes
Background controls	Yes	Yes	Yes	Yes	Yes
Controls × Cohort size	Yes	Yes	Yes	Yes	Yes
Observations	17,750	15,138	16,719	17,043	17,695

Notes: Unit of observation is the score for a given IAS officer in 2012-13 with at least 8 years of tenure. Panel A relates the five performance measures (effectiveness, probity, ability to withstand illegitimate political pressure, pro-poor orientedness and overall rating) to age at entry, cohort size and their interaction, where cohort size is the size of the state cohort in which the officer was allocated to, centered around the sample mean. Background controls are: a female dummy, caste dummies (OBC, SC, ST), a dummy for coming from an urban background, having received an academic distinction, a STEM or Economics degree, having worked in education/research, private sector/SOEs, public sector, public AIS, standardized scores for the (UPSC) entry and training scores, as well as a dummy that is 1 if the officer improved the ranking in the training relative to the entry exam. Interviewer FEs are dummies for each interviewer. State-specific respondent FEs are fixed effects for each respondent. Tenure year FEs are dummies for each year since entering the IAS. Source of information FEs are dummies for whether the respondent knows the officer personally, through friends or only through media. Panel B interacts all background characteristics with cohort size. Robust standard errors in parentheses, clustered at the respondent level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 5: Effectiveness and own cohort age composition

	(1)	(2)	(3)	(4)	(5)
	360 ratings - 2012/13				
	Effective	Probity	Pressure	Pro-Poor	Overall
Mean of dep. var.	3.730	3.671	3.524	3.528	3.647
Cohort size: Younger	-0.009*	-0.005	-0.014**	-0.009	-0.016**
	(0.005)	(0.007)	(0.007)	(0.006)	(0.006)
Cohort size: Older	0.000	0.002	0.000	0.004	0.000
	(0.004)	(0.006)	(0.005)	(0.005)	(0.005)
Interviewer FEs	Yes	Yes	Yes	Yes	Yes
State-specific respondent FEs	Yes	Yes	Yes	Yes	Yes
Tenure year FEs	Yes	Yes	Yes	Yes	Yes
Source of information FEs	Yes	Yes	Yes	Yes	Yes
Background controls	Yes	Yes	Yes	Yes	Yes
Age at entry FEs	Yes	Yes	Yes	Yes	Yes
Observations	17,750	15,138	16,719	17,043	17,695

Notes: Unit of observation is the score for a given IAS officer in 2012-13 with at least 8 years of tenure. Relating the age composition of an IAS officer's cohort to the five measures of performance (effectiveness, probity, ability to withstand illegitimate political pressure, pro-poor orientedness and overall rating). Cohort size: Younger denotes the number of offices in the same state cohort that are younger, and Cohort size: Older denotes the number of officers in the same state cohort that are older. Background controls are: a female dummy, caste dummies (OBC, SC, ST), a dummy for coming from an urban background, having received an academic distinction, a STEM or Economics degree, having worked in education/research, private sector/SOEs, public sector, public AIS, standardized scores for the (UPSC) entry and training scores, as well as a dummy that is 1 if the officer improved the ranking in the training relative to the entry exam. Interviewer FEs are dummies for each interviewer. State-specific respondent FEs are fixed effects for each respondent. Tenure year FEs are dummies for each year since entering the IAS. Source of information FEs are dummies for whether the respondent knows the officer personally, through friends or only through media. Robust standard errors in parentheses, clustered at the respondent level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 6: Age at entry, cohort size and suspension 1980-2012

	(1)	(2)	(3)	(4)	(5)	(6)
	Number of suspensions					
Mean of dep. var	0.0583	0.0583	0.0583	0.0637	0.0637	0.0637
Age at entry	0.001	0.001	0.001	0.004*	0.004*	0.004*
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
Cohort size (centered)	-0.037*	-0.035	-0.039*	-0.009	-0.013	-0.012
	(0.021)	(0.021)	(0.023)	(0.011)	(0.011)	(0.011)
Age at entry × Cohort size	0.002*	0.002*	0.002*	0.001	0.001*	0.001*
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
State FEs	Yes	-	-	Yes	-	-
Tenure year FEs	Yes	-	-	Yes	-	-
State-Tenure year FEs	-	Yes	Yes	-	Yes	Yes
Controls × Cohort size	-	-	Yes	-	-	Yes
Sample	Rich controls			Full sample		
Observations	42,629	42,605	42,567	108,725	108,663	108,663

Notes: Unit of observation is the IAS officer in a given year. The dependent variable is the cumulative number of suspensions of an IAS officer up to the given year. Columns 1-3 report the estimates based on the restricted sample which controls for rich individual-level background characteristics: a female dummy, caste dummies (OBC, SC, ST), a dummy for coming from an urban background, having received an academic distinction, a STEM or Economics degree, having worked in education/research, private sector/SOEs, public sector, public AIS, standardized scores for the (UPSC) entry and training scores, as well as a dummy that is 1 if the officer improved the ranking in the training relative to the entry exam. Columns 4-6 is based on the full sample for 1980-2012 and controls only for gender. Standard errors are clustered at the individual IAS officer level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 7: Impact of pension reform on suspensions - 1980-2012

	(1)	(2)	(3)	(4)
	Suspended (× 100)			
Mean of dep. var	0.740	0.740	0.740	0.741
Age at entry	0.089***	0.084***	0.083*	
	(0.028)	(0.029)	(0.048)	
Age at entry × Post 1998	-0.102**	-0.093**	-0.091	-0.103
	(0.040)	(0.040)	(0.072)	(0.073)
Age at entry × Year			-0.000	0.009*
			(0.003)	(0.005)
Year FEs	Yes	Yes	Yes	Yes
State FEs	Yes	-	-	-
Tenure year FEs	Yes	-	-	-
State-Tenure year FEs	-	Yes	Yes	Yes
Individual FEs	-	-	-	Yes
Individual control	Yes	Yes	Yes	-
Observations	107,540	107,537	107,537	107,369

Notes: Unit of observation is the IAS officer in a given year between 1980-2012. Relating the differential impact of age at entry before and after the pension reform in 1998 to suspensions. Suspension is scaled by 100 to improve readability. Individual control holds constant gender of the officer. Age at entry × Year allows age at entry to trend linearly. The year is centered around 1998. Standard errors are clustered at the individual level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 8: State-level GDP per capita and age at entry × cohort size

	(1)	(2)	(3)	(4)
	(log) State-level GDP per capita 1990-2011			
		Disaggregated by sector		
	Overall	Agriculture	Industry	Service
Age at entry	-0.102	-0.071	-0.168	-0.090
	(0.107)	(0.128)	(0.207)	(0.133)
Cohort size (centered)	1.324***	0.311	2.760***	1.577***
	(0.362)	(0.466)	(0.817)	(0.429)
Age at entry × Cohort size	-0.051***	-0.014	-0.115***	-0.058***
	(0.015)	(0.020)	(0.034)	(0.018)
State FEs and Year FEs	Yes	Yes	Yes	Yes
Region-specific trends	Yes	Yes	Yes	Yes
Background controls	Yes	Yes	Yes	Yes
Observations	305	305	305	305

Notes: Unit of observation is the state-year. Relating (log) state-level GDP per capita to the average state cadre age at entry, cohort size and its interaction. Cohort size is centered around the sample mean. Background controls are: the (log) overall cadre size, which includes all active IAS officers in a given state (including those recruited from the state civil services and below 8 years of tenure), and the share of female. Region-specific trends allow for linear trends that vary by 5 regions: North India, Northeast India, South India, and West India. Standard errors in parentheses, clustered at the state-level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 9: State-level GDP per capita and age at entry × cohort size by seniority

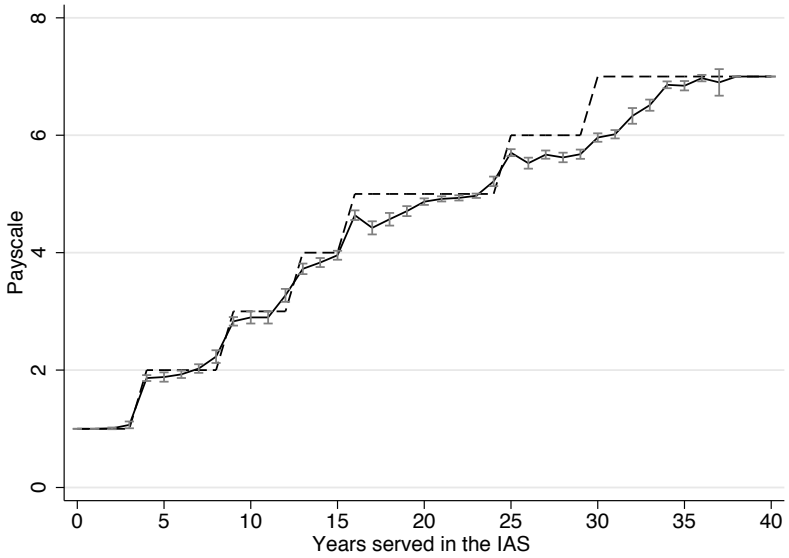
	(1)	(2)	(3)	(4)
Panel A: State GDP per capita	Overall	Agriculture	Industry	Service
Senior avg. age at entry × Avg. cohort size	-0.036*	-0.001	-0.101**	-0.059**
	(0.017)	(0.025)	(0.036)	(0.023)
Junior avg. age at entry × Avg. cohort size	0.003	0.003	0.016	0.006
	(0.008)	(0.014)	(0.020)	(0.009)
State FEs and Year FEs	Yes	Yes	Yes	Yes
Background controls	Yes	Yes	Yes	Yes
Region-specific trends	Yes	Yes	Yes	Yes
Observations	305	305	305	305
Panel B: Industrial GDP	Mining	Registered	Unregistered	Utilities
Senior avg. age at entry × Avg. cohort size	-0.181**	-0.142***	-0.005	-0.239***
	(0.061)	(0.036)	(0.033)	(0.045)
Junior avg. age at entry × Avg. cohort size	-0.070**	0.024	0.043	-0.099**
	(0.027)	(0.028)	(0.026)	(0.040)
State FEs and Year FEs	Yes	Yes	Yes	Yes
Background controls	Yes	Yes	Yes	Yes
Region-specific trends	Yes	Yes	Yes	Yes
Observations	305	305	305	305
Panel C: Annual Survey of Industries	Factories	Workers	Value added	Output
Senior avg. age at entry × Avg. cohort size	-0.070***	-0.074**	-0.050	-0.094***
	(0.016)	(0.033)	(0.072)	(0.027)
Junior avg. age at entry × Avg. cohort size	0.013	0.032**	0.042	0.011
	(0.009)	(0.013)	(0.041)	(0.019)
State FEs and Year FEs	Yes	Yes	Yes	Yes
Background controls	Yes	Yes	Yes	Yes
Region-specific trends	Yes	Yes	Yes	Yes
Observations	304	304	304	301
Panel D: Service sector GDP	Construction	Transport	Trade	Banking
Senior avg. age at entry × Avg. cohort size	0.024	-0.093***	-0.048	-0.066***
	(0.066)	(0.020)	(0.052)	(0.021)
Junior avg. age at entry × Avg. cohort size	-0.018	-0.001	-0.000	-0.009
	(0.035)	(0.013)	(0.019)	(0.012)
State FEs and Year FEs	Yes	Yes	Yes	Yes
Background controls	Yes	Yes	Yes	Yes
Region-specific trends	Yes	Yes	Yes	Yes
Observations	305	305	305	305
Panel E: Public expenditure	Total	Social	Economic	World Bank
Senior avg. age at entry × Avg. cohort size	-0.033*	-0.052**	-0.106***	-0.056
	(0.019)	(0.022)	(0.029)	(0.104)
Junior avg. age at entry × Avg. cohort size	-0.012	0.003	0.001	-0.023
	(0.012)	(0.018)	(0.030)	(0.061)
State FEs and Year FEs	Yes	Yes	Yes	Yes
Background controls	Yes	Yes	Yes	Yes
Region-specific trends	Yes	Yes	Yes	Yes
Observations	305	305	305	305

(continued)

Panel F: Public revenue	(1) Total	(2) State own	(3) Central	(4) Non-tax
Senior avg. age at entry × Avg. cohort size	-0.039**	-0.078***	-0.053**	-0.023
	(0.014)	(0.025)	(0.023)	(0.035)
Junior avg. age at entry × Avg. cohort size	0.003	0.011	0.019	-0.020
	(0.008)	(0.015)	(0.013)	(0.020)
State FEs and Year FEs	Yes	Yes	Yes	Yes
Background controls	Yes	Yes	Yes	Yes
Region-specific trends	Yes	Yes	Yes	Yes
Observations	305	305	305	305

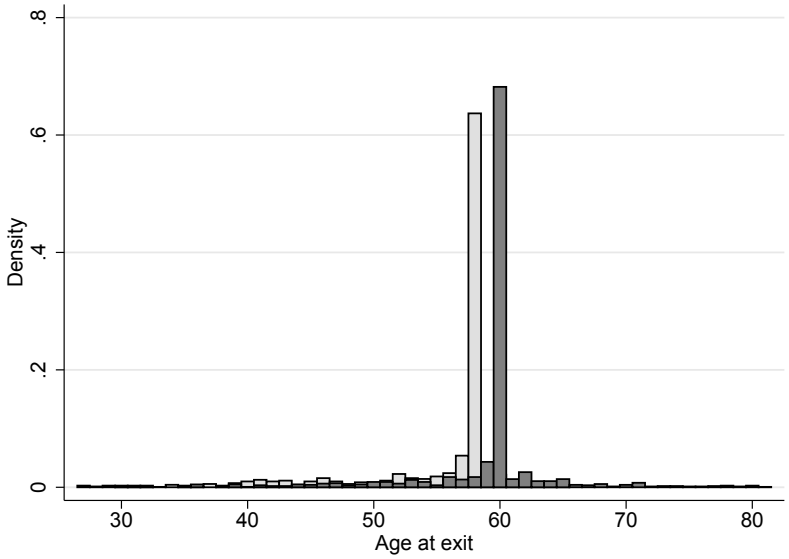
Notes: Unit of observation is the state-year. Relationship between (log) state-level outcomes and the junior/senior average state cadre age at entry, cohort size (centered around sample mean), their interaction, as well as the share of females among junior/senior IAS officers, controlling for the (log) overall cadre size and allowing for region-specific linear trends. In Panel A, the dependent variable is the (log) total state-level GDP per capita and its breakdown by sectors. In Panel B, the dependent variable are (log) state-level GDP components of the industrial sector, broken down by mining, registered and unregistered manufacturing and utilities. In Panel C, the dependent variables are industry-level outcomes from the Annual Survey of Industries (ASI): the (log) number of factories, (log) number of workers, the (log) value added and (log) industrial output. In Panel D, the dependent variables are (log) state-level GDP components of the service sector: construction, transport (railroads, road transport, water transport, air transport etc.), trade (trade and repair services, retail, hotel and restaurants), and banking (financial services and insurance). In Panel E, the dependent variable is (log) state-level expenditure: total expenditure, social (education, health, welfare, housing, relief) and economic expenditures (rural development, special area programmes, irrigation, energy, industry, transport and communications), and number of new World Bank projects. In Panel F, the dependent variables are: (log) total revenue, state-own revenue (taxes on income, property and capital transactions), central revenue (corporation tax, income tax, estate, duty) and non-tax revenue (interest receipts, dividends and profits). Standard errors in parentheses, clustered at the state-level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Figure 1: Seniority based progression: Average payscale and years of tenure



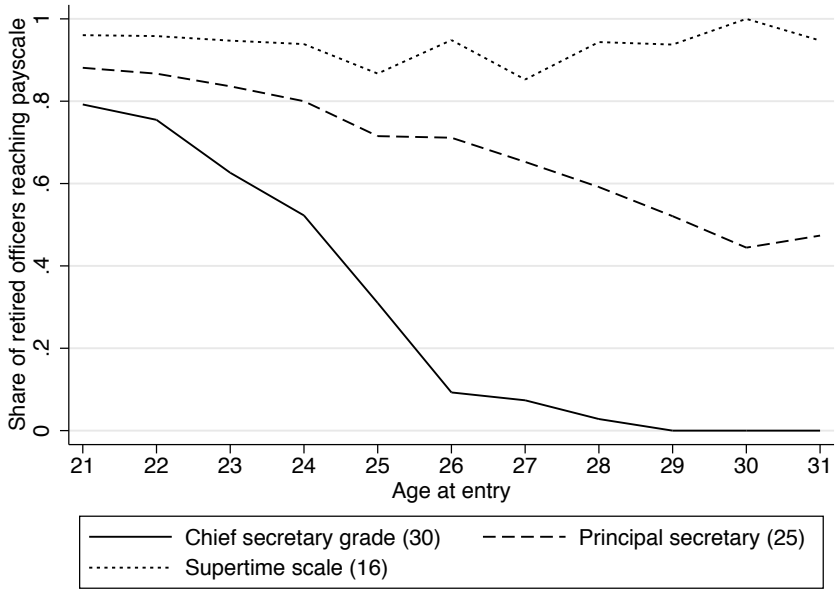
Notes: Average payscale of IAS officers as a function of the years served in the IAS (solid line) for the cross-section of all centrally recruited IAS officers active in 2012. The dashed line marks the payscale as predicted using the IAS promotion guidelines.

Figure 2: Distribution of age at retirement pre/post-1998



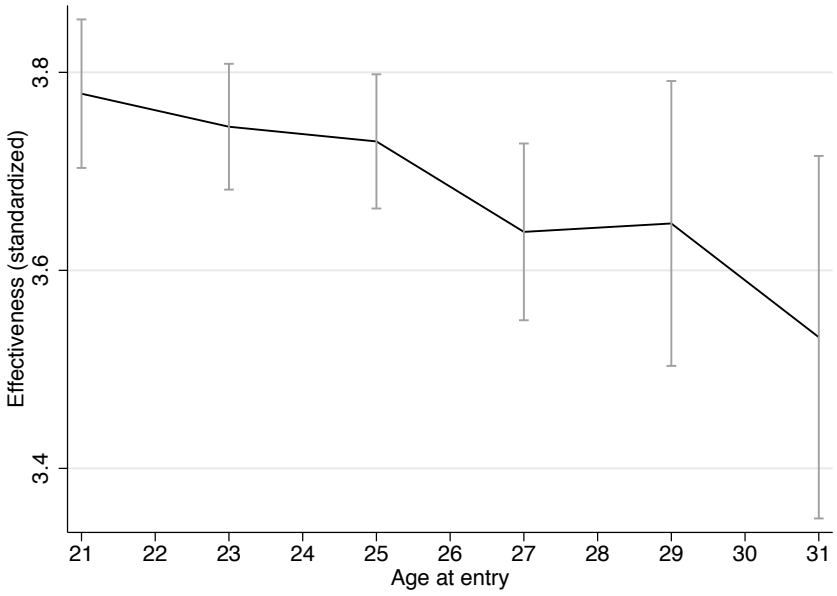
Notes: Distribution of age at exit from IAS among retired officers in 2012. Grey (black) bars denote retirement before (after) 1998. The retirement age was raised from 58 to 60 in 1998.

Figure 3: Share of retired officers reaching senior payscales as a function of age at entry



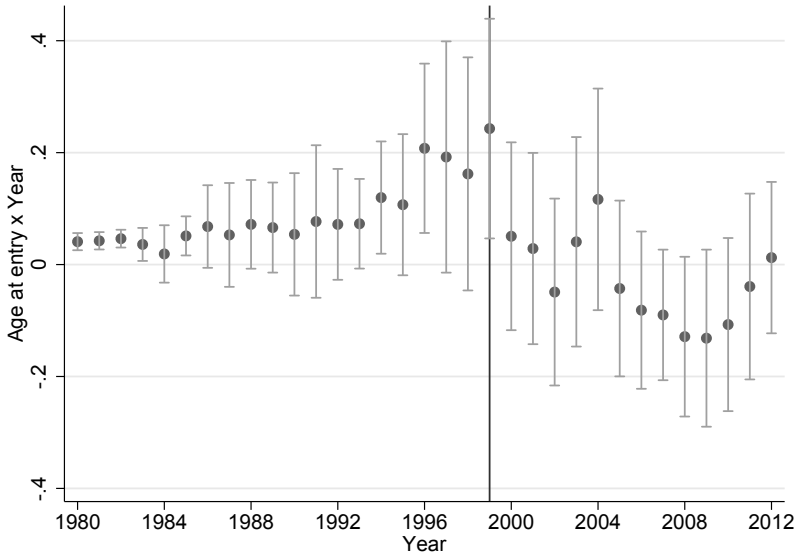
Notes: Share of retired officers in 2012 reaching senior payscales as a function of age at entry. Number in parentheses indicates the minimum number of years to qualify for the position.

Figure 4: Effectiveness score and age at entry



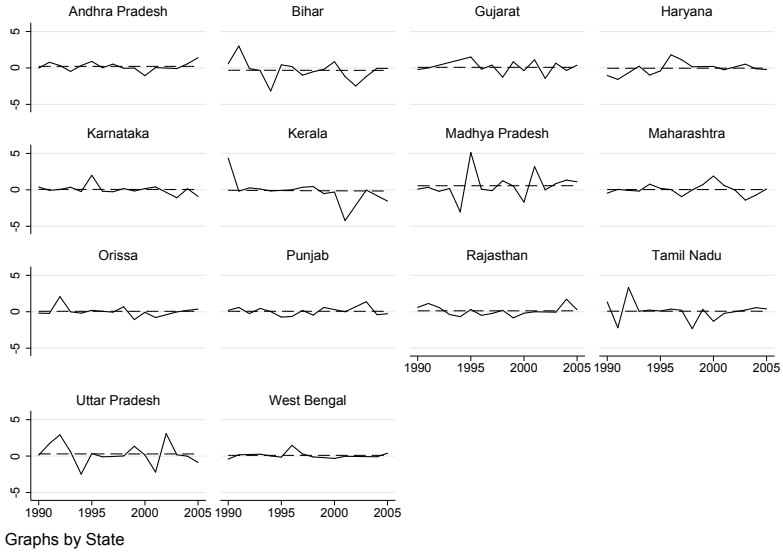
Notes: Raw correlation between the standardized effectiveness score and age at entry. Standard errors used are clustered at the respondent-level.

Figure 5: Pension reform 1998 - Age at entry and suspensions by year



Notes: Summarizing the interaction coefficients for a regression of the suspension dummy on age at entry interacted with each year dummy between 1985-2012. The regression includes year FEs and state-specific tenure year FEs. The coefficients are rescaled by 100 to improve readability. The solid line marks the pension reform. Standard errors used for computation of the 95% confidence intervals are clustered at the individual-level.

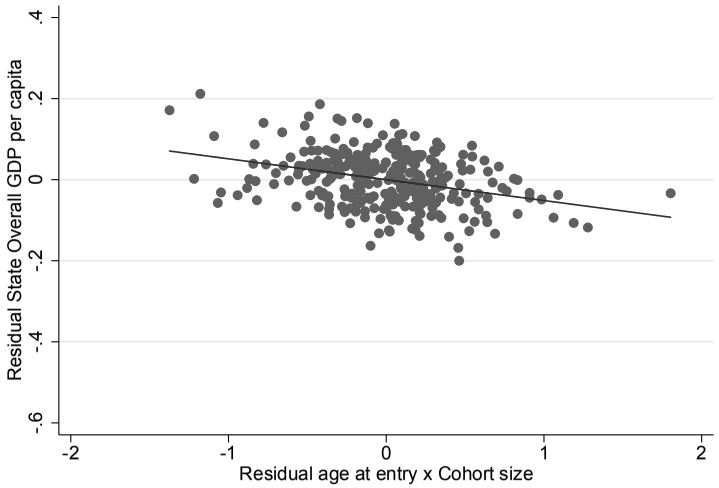
Figure 6: Quasi-random allocation across states: Age at entry × Cohort size



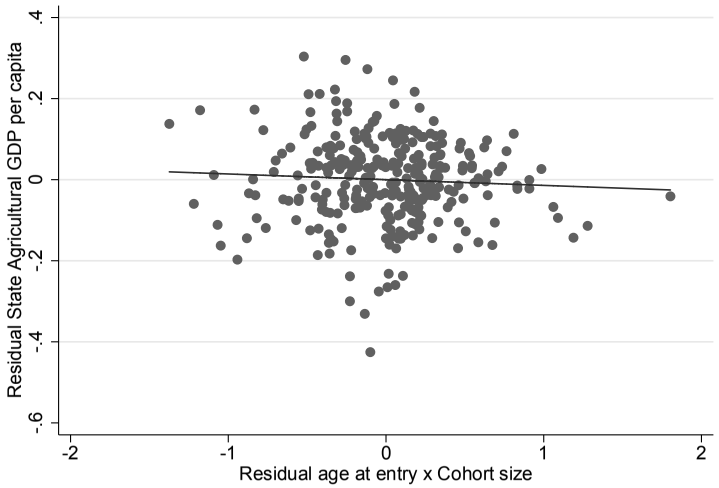
Notes: Interaction between average age at entry and cohort size (standardized relative to their year of intake) 1972-2009. The trend line is fitted as a non-parametric local polynomial.

Figure 7: State-level GDP per capita and age at entry × cohort size

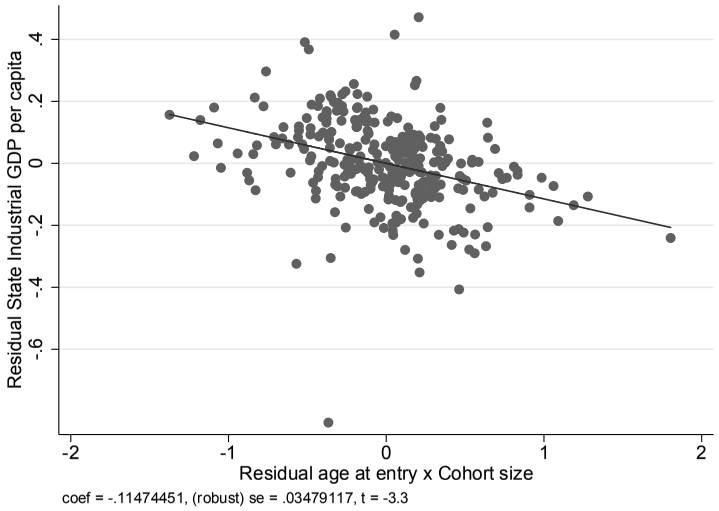
(a) Total GDP per capita



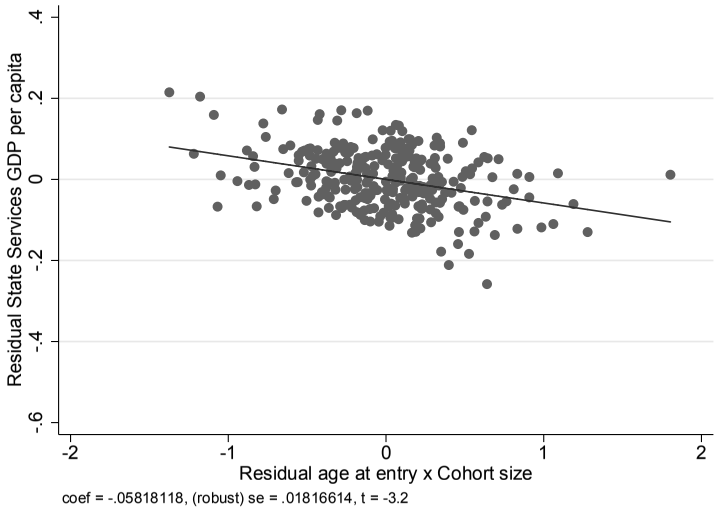
(b) Agricultural GDP per capita



(c) Industrial GDP per capita



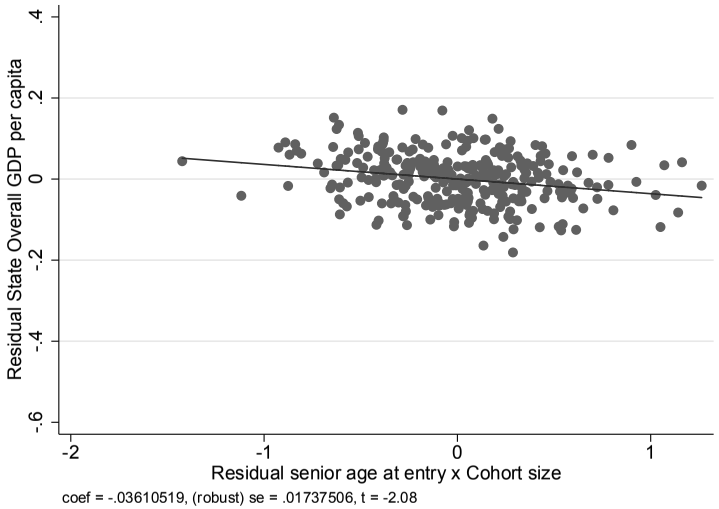
(d) Service GDP per capita



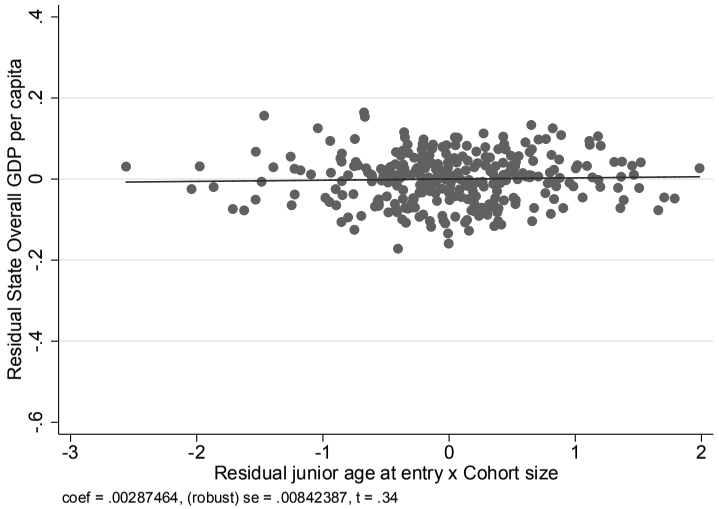
Notes: The unit of observation is the state-year. Reporting the partial (residual) correlation between age at entry × cohort size and (real) state-level GDP per capita 1990-2011.

Figure 8: State-level GDP per capita and Age at entry × ln(Cohort size), by seniority

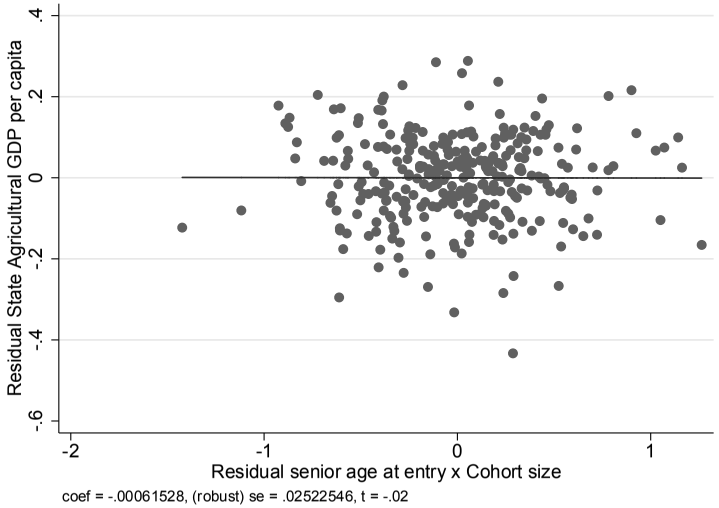
(a) Total GDP per capita, Senior cadre



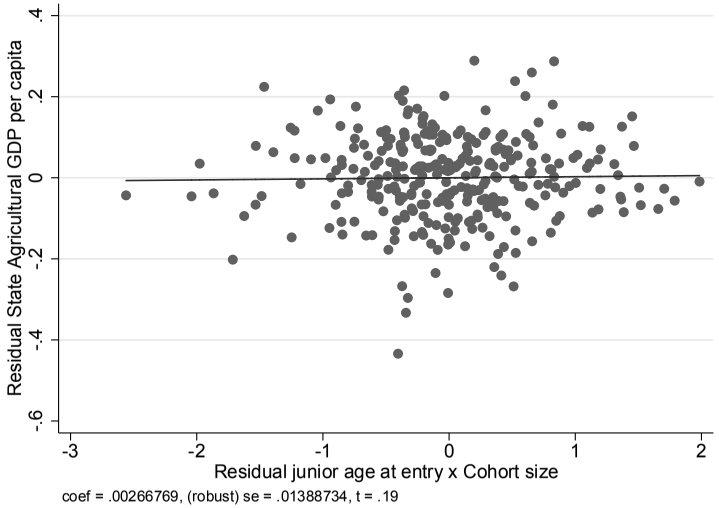
(b) Total GDP per capita, Junior cadre



(c) Agricultural GDP per capita, Senior cadre

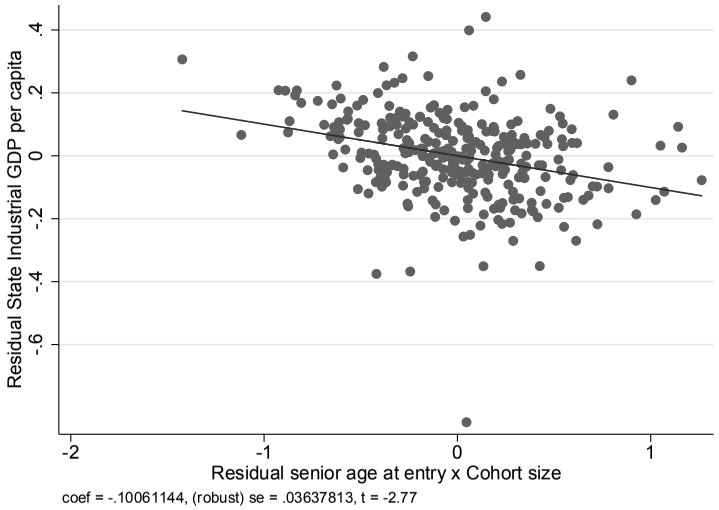


(d) Agricultural GDP per capita, Junior cadre

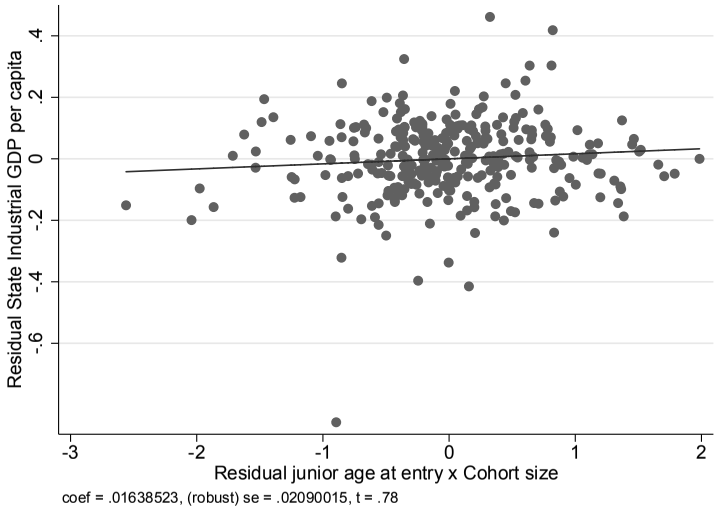


(continued)

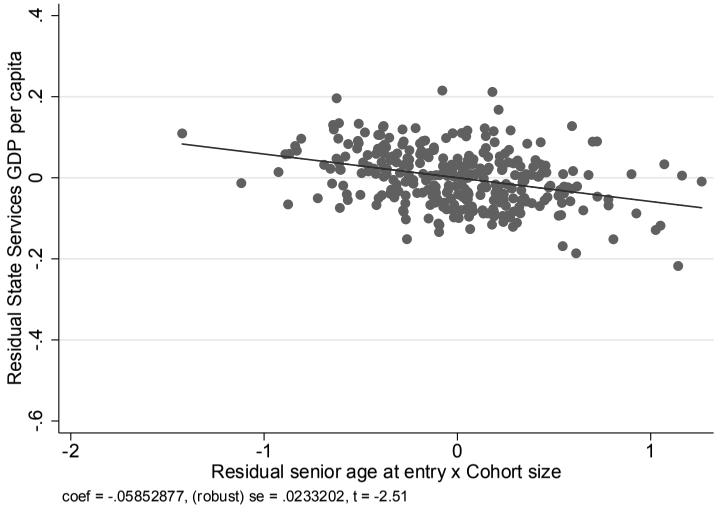
(a) Industrial GDP per capita, Senior cadre



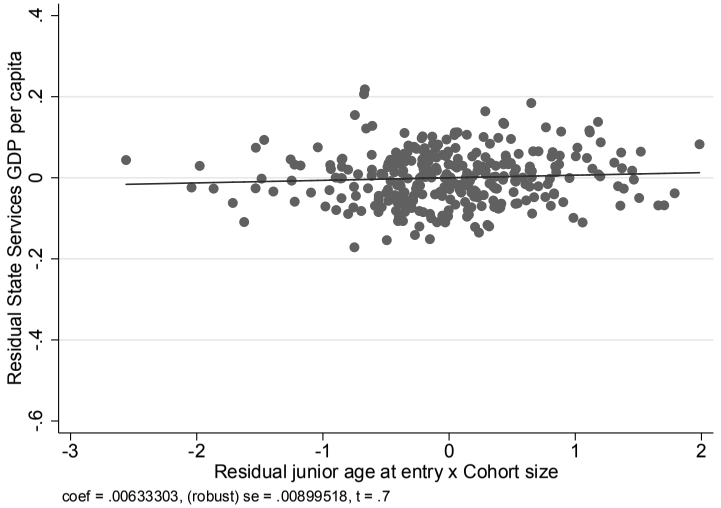
(b) Industrial GDP per capita, Junior cadre



(c) Service GDP per capita, Senior cadre



(d) Service GDP per capita, Junior cadre



Notes: Unit of observation is the state-year. Reporting the partial correlation between age at entry × cohort size and state-level GDP per capita 1992-2011, broken down by effectiveness of junior (8-15 years tenure) and senior ($\geq$ 16 years tenure) officers and sectors (agriculture, industry and services).

6 Appendix (for online publication)

Table A1: IAS Promotion Guidelines - Seniority based progression

Scale	Level	Years	Description	Grade
1.	Junior time scale	0	Entry level	Jr. Time Scale
2.	Senior time scale	4	Committee of Chief Secretary and two supertime scale officers to evaluate and decide suitability of promotion - subject to vacancies	Sr. Time Scale
3.	Jr. Admin. Grade	9	Non-functional, admissable without any screening except when disciplinary proceedings are pending against the officer	Under Secy, Dy Secy Level/JAG, Dy Secy Equiv, Dy Secy, Under Secy Equiv, Under Secy Level
4.	Selection Grade	13	Committee of Chief Secretary and two supertime scale officers (or above) to screen - subject to vacancies	Dir Level/SLJAG, Directory Equiv, Director
5.	Supertime scale	16	Committee of Chief Secretary and two principal secretaries (if unavailable, seniormost supertime scale officer) to screen - subject to vacancies	JS Level/Level-I, Joint Secy, Joint Secy (Ex-Off), Joint Secy Equiv, Addl Secy Level, Addl Secy, Addl Secy (Ex-Off)
6.	Principal secretary	25	Committee of Chief Secretary and one senior most officer on the Chief Secretary level to screen. Subject to vacancies.	Secretary, Secy (Ex-Off), Secy Equiv
7.	Chief Secretary	30	Committee of Chief Secretary, one officer in same grade within state, one officer serving at Centre	Above Secy Level, Cab Secy

Notes: IAS Promotion Guidelines (2000): No. 20011/4/92/AIS-II.

Table A2: 360 degree measures of effectiveness, by stakeholder group

		(1)	(2)	(3)	(4)	(5)
		Subjective ratings				
		Effective	Probity	Pressure	Pro-Poor	Overall
IAS	Mean	3.921	3.918	3.835	3.882	3.879
	SD	0.990	1.072	0.985	0.992	0.996
	N	4,932	4,217	4,767	4,752	4,955
State Civil Service	Mean	3.943	3.810	3.532	3.802	3.839
	SD	0.988	1.116	1.108	1.089	1.061
	N	2,571	2,041	2,422	2,468	2,611
Large firms	Mean	3.748	3.704	3.553	3.530	3.724
	SD	1.057	0.983	1.040	0.977	0.982
	N	2,708	2,402	2,541	2,575	2,661
MLAs	Mean	3.642	3.518	3.258	3.302	3.512
	SD	1.138	1.185	1.183	1.313	1.036
	N	2,595	2,164	2,367	2,473	2,580
NGOs	Mean	3.535	3.528	3.307	3.283	3.455
	SD	1.125	1.141	1.172	1.162	1.076
	N	1,927	1,694	1,816	1,856	1,930
Media (Print & TV)	Mean	3.421	3.350	3.322	3.060	3.258
	SD	1.116	1.047	1.039	1.124	1.075
	N	3,020	2,635	2,815	2,923	2,961
Pooled	Mean	3.730	3.670	3.523	3.527	3.646
	SD	1.077	1.105	1.094	1.141	1.057
	N	17,753	15,153	16,728	17,047	17,698

Notes: Descriptive statistics (mean, standard deviation (SD) and sample size) of 360 degree measures of effectiveness, broken down by the assessing stakeholder group. The abbreviation MLAs stands for members of the legislative assembly. NGOs stands for non-governmental organization.

Table A3: 360 degree measures of effectiveness, by source of information

		(1)	(2)	(3)	(4)	(5)
		Subjective ratings				
		Effective	Probity	Pressure	Pro-Poor	Overall
Personal interaction	Mean	3.928	3.772	3.665	3.671	3.786
	SD	0.979	1.069	1.056	1.118	1.038
	N	9,751	8,325	9,407	9,492	9,724
Friends & Networks	Mean	3.179	3.546	3.328	3.306	3.461
	SD	1.239	1.152	1.108	1.107	1.062
	N	3,149	2,673	2,770	2,884	3,143
Media	Mean	3.689	3.545	3.347	3.371	3.486
	SD	1.022	1.124	1.119	1.165	1.052
	N	4,853	4,155	4,551	4,671	4,831
Pooled	Mean	3.730	3.670	3.523	3.527	3.646
	SD	1.077	1.105	1.094	1.141	1.057
	N	17,753	15,153	16,728	17,047	17,698

Notes: Descriptive statistics (mean, standard deviation (SD) and sample size) of 360 degree measures of effectiveness, broken down by source of information. Personal interaction are assessments provided by respondents who know the rated officer personally. Friends & networks are those known through friends or social (work) networks, and media are those known through television, radio or newspaper.

Table A4: 360 measures and age at entry - Full controls

	(1)	(2)	(3)	(4)	(5)
	Effective	Probity	Pressure	Pro-poor	Overall
Mean of dep. var	3.730	3.671	3.524	3.528	3.647
Age at entry	-0.009**	-0.009**	-0.015***	-0.007*	-0.010**
	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)
Entry score	0.041***	0.021	0.023**	0.021*	0.041***
	(0.010)	(0.013)	(0.011)	(0.012)	(0.010)
Training score	0.020**	0.011	0.017**	0.004	0.016*
	(0.008)	(0.010)	(0.008)	(0.009)	(0.009)
Improved	0.092***	0.058**	0.032	0.045**	0.044**
	(0.019)	(0.023)	(0.020)	(0.021)	(0.021)
Female	0.012	-0.022	-0.041*	0.042*	-0.001
	(0.020)	(0.024)	(0.021)	(0.022)	(0.023)
Caste: OBC	-0.027	-0.117***	-0.074**	-0.033	-0.031
	(0.031)	(0.045)	(0.037)	(0.037)	(0.037)
Caste: SC	0.038	0.001	0.058**	0.020	0.058**
	(0.024)	(0.031)	(0.028)	(0.028)	(0.027)
Caste: ST	-0.102***	-0.142***	-0.065	-0.085**	-0.067
	(0.039)	(0.047)	(0.041)	(0.039)	(0.042)
Urban background	-0.011	0.007	0.023	-0.002	-0.013
	(0.015)	(0.018)	(0.017)	(0.017)	(0.017)
Academic distinction	0.001	0.009	0.007	0.000	0.006
	(0.015)	(0.017)	(0.016)	(0.016)	(0.016)
STEM or Economics	0.013	-0.024	-0.002	-0.007	0.000
	(0.012)	(0.017)	(0.015)	(0.014)	(0.014)
Previous: Education/Research	0.042**	0.013	0.052**	0.036*	0.015
	(0.018)	(0.023)	(0.021)	(0.020)	(0.020)
Previous: Finance/Banking	0.023	-0.003	0.030	0.048	0.026
	(0.029)	(0.038)	(0.031)	(0.031)	(0.034)
Previous: Private/SOE	0.054***	0.020	0.062***	0.033	0.039*
	(0.020)	(0.027)	(0.024)	(0.024)	(0.023)
Previous: Public	0.020	-0.004	0.031*	0.003	-0.007
	(0.017)	(0.020)	(0.018)	(0.018)	(0.018)
Previous: AIS	-0.046	-0.011	0.038	-0.071*	-0.070
	(0.039)	(0.051)	(0.044)	(0.042)	(0.043)
State-specific respondent FEs	Yes	Yes	Yes	Yes	Yes
Source of information FEs	Yes	Yes	Yes	Yes	Yes
Interviewer FEs	Yes	Yes	Yes	Yes	Yes
Tenure year FEs	Yes	Yes	Yes	Yes	Yes
Observations	17,750	15,138	16,719	17,043	17,695

Notes: Unit of observation is the score for a given IAS officer in 2012-13 with at least 8 years of tenure. Relating the five performance measures to age at entry, cohort size and their interaction, where cohort size is the size of the state cohort in which the officer was allocated to, centered around the sample mean. State-specific respondent FEs are fixed effects for each respondent. Tenure year FEs are dummies for each year since entering the IAS. Source of information FEs are dummies for whether the respondent knows the officer personally, through friends or only through media. Standard errors clustered at the respondent level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A5: Test for (quasi-)random allocation across states

H_0: Random allocation across states	(1) p-value
Age at entry	0.143
Female	0.903
Other backward caste (OBC)	0.413
Scheduled caste (SC)	0.173
Scheduled tribe (ST)	0.191
Urban background	0.495
Academic distinction	0.226
STEM and Economics degree	0.506
Previous job: Education/research	0.305
Previous job: Finance/banking	0.256
Previous job: Private/SOE	0.454
Previous job: Public sector	0.103
Previous job: Public AIS	0.660
Ranking in year of intake	0.515
UPSC score	0.215
Training score	0.309
Improved	0.669
Cohort size (centered around state mean)	0.620
Age at entry × Cohort size (centered around state mean)	0.636

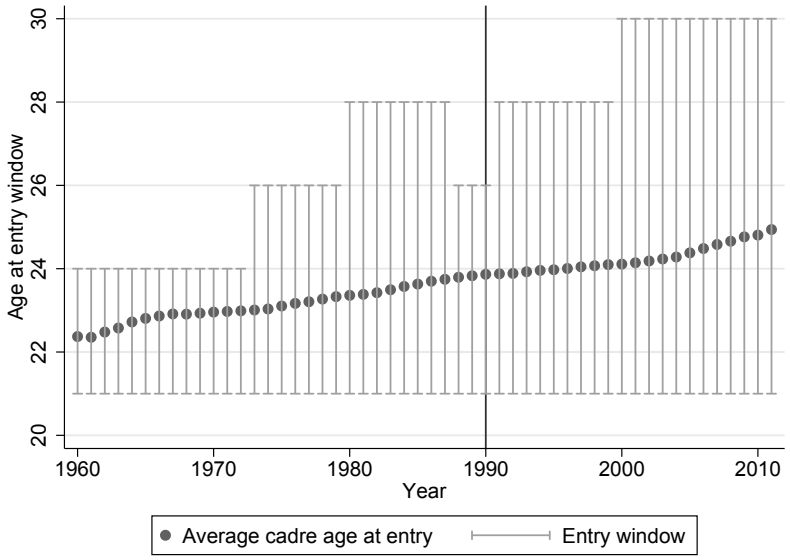
Notes: Test for random allocation across states for each year of intake between 1972-2009. The test is implemented by regressing the individual characteristics of the IAS officers on a set of state fixed effects and cadre fixed effects, and then testing the equality of the estimated state fixed effects. The total number of individuals in the sample is $N = 1{,}578$. Robust standard errors. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A6: 360 measures and suspensions

	(1)	(2)	(3)	(4)	(5)
	360 ratings - 2012/13				
	Effective	Probity	Pressure	Pro-Poor	Overall
On suspension	-0.004***	-0.007***	-0.007***	-0.005***	-0.008***
	(0.08)	(0.09)	(0.08)	(0.07)	(0.10)
Interviewer FEs	Yes	Yes	Yes	Yes	Yes
State-specific respondent FEs	Yes	Yes	Yes	Yes	Yes
Tenure year FEs	Yes	Yes	Yes	Yes	Yes
Source of information FEs	Yes	Yes	Yes	Yes	Yes
Observations	17,750	15,138	16,719	17,043	17,695

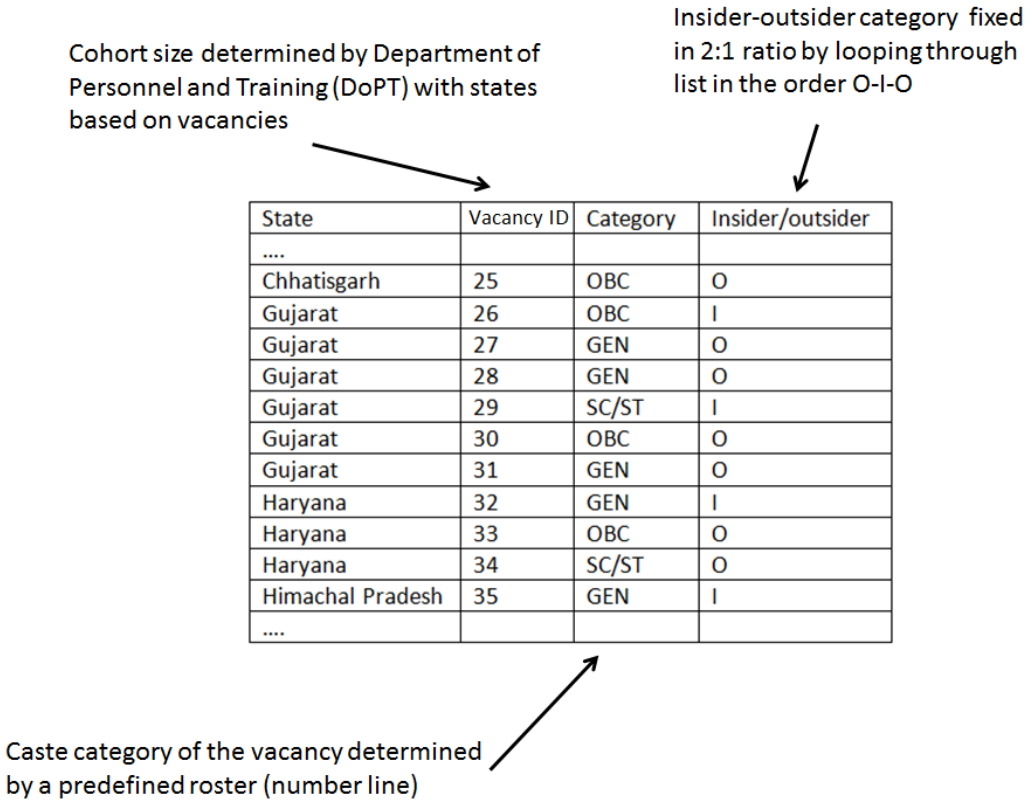
Notes: Unit of observation is the score for a given IAS officer in 2012-13 with at least 8 years of tenure. On suspension is a dummy that is 1 if the IAS officer is suspended in 2012-13. Interviewer FEs are dummies for each interviewer. State-specific respondent FEs are fixed effects for each respondent. Tenure year FEs are dummies for each year since entering the IAS. Source of information FEs are dummies for whether the respondent knows the officer personally, through friends or only through media. Standard errors in parentheses, clustered at the respondent level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Figure B1: Statutory age at entry window of the IAS over time



Notes: Statutory age at entry window for general candidates of the IAS over time. Solid line marks beginning of the sample period for the state-level panel.

Figure B2: Determination of vacancies: Example 2006



State	Vacancy ID	Category	Insider/outsider
....			
Chhatisgarh	25	OBC	O
Gujarat	26	OBC	I
Gujarat	27	GEN	O
Gujarat	28	GEN	O
Gujarat	29	SC/ST	I
Gujarat	30	OBC	O
Gujarat	31	GEN	O
Haryana	32	GEN	I
Haryana	33	OBC	O
Haryana	34	SC/ST	O
Himachal Pradesh	35	GEN	I
....			

Notes: Illustrating the assignment of categories (caste and home preference) to vacancies through the roster randomization for the year 2006. Vacancies are earmarked by caste status (O.B.C. denotes other backward castes, S.C./S.T. scheduled castes/tribes and unreserved the general castes) and home state ("I" denotes insider vacancies reserved for applicants from the same state; "O" denotes outsider vacancies reserved for applicants from other states). The assignment occurs through a number line.

Figure B3: Assignment of categories (caste and home preference) to vacancies through roster randomization

Cadre Allocation - 2006

Distribution of vacancies to be filled in various cadres/joint cadres of Indian Administrative Service (IAS) on the basis of Civil Services Examination 2006, among Insider and Outsider Vacancies and between categories.

Sl. No.	Name of the State Cadre / Joint Cadre	Unreserved Insider	Unreserved Outsider	OBC Insider	OBC Outsider	SC/ST Insider	SC/ST Outsider	Total
1	A G M U T	1	2	1	0	0	1	5
2	Andhra Pradesh	1	1	0	0	0	0	2
3	Assam Meghalaya	1	2	0	1	1	0	5
4	Bihar	2	1	0	2	1	1	7
5	Chhatisgarh	0	3	1	1	1	0	6
6	Gujarat	0	3	1	1	1	0	6
7	Haryana	1	0	0	1	0	1	3
8	Himachal Pradesh	1	0	0	0	0	0	1
9	Jammu & Kashmir	0	1	0	0	0	0	1
10	Jharkhand	0	1	0	0	0	0	1
11	Karnataka	0	1	1	0	0	1	3
12	Kerala	1	0	0	1	0	0	2
13	Madhya Pradesh	2	1	0	1	0	1	5
14	Maharashtra	1	2	0	1	1	0	5
15	Manipur Tripura	0	3	0	1	1	0	5
16	Nagaland	0	1	0	1	1	0	3
17	Orissa	1	1	0	1	0	1	4
18	Punjab	0	1	1	0	0	1	3
19	Rajasthan	0	1	1	0	0	1	3
20	Sikkim	0	0	1	0	0	1	2
21	Tamil Nadu	0	1	1	0	0	0	2
22	Uttar Pradesh	1	2	0	2	1	1	7
23	Uttaranchal	1	0	0	1	0	1	3
24	West Bengal	0	3	1	0	0	1	5
		14	31	9	15	8	12	89

Notes: The final distribution of vacancies by state and caste/home quota for the year 2006. Vacancies are earmarked by caste status (O.B.C. denotes other backward castes, S.C./S.T. scheduled castes/tribes and unreserved the general castes) and home state (insider vacancies are reserved for applicants from the same state; outsider vacancies are reserved for applicants from other states).

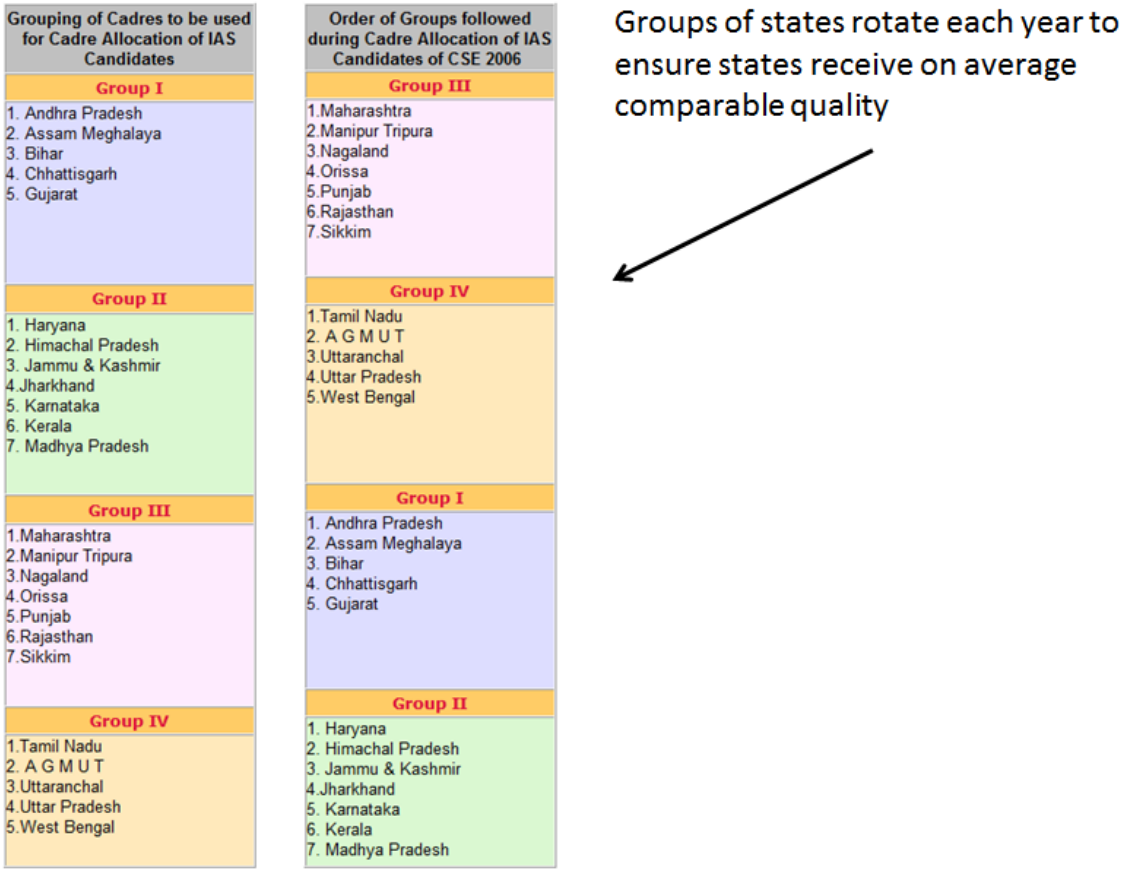
Figure B4: Merit-based (UPSC rank) allocation based on caste and home preference match

Master Statement in respect of candidates allotted to Indian Administrative Service on the basis of Civil Services (Main) Examination, 2006 for purpose of their Cadre Allocation

Sl. No.	Rank	Name of the Candidate	Home State	Category	Whether Home State Opted?
1	1	MUTYALARAJU REVU	Andhra Pradesh	O.B.C*	Yes
2	2	AMIT SAINI	Punjab	General	Yes
3	3	ALOK TIWARI	Uttar Pradesh	General	Yes
4	4	PRASANTH N	Kerala	General	Yes
5	5	SHASHANK MISRA	Uttar Pradesh	General	Yes
6	6	VYASAN R	Kerala	General	No
7	8	ANINDITA MITRA	Chhatisgarh	General	No
8	9	ARAVIND AGRAWAL	Orissa	General	Yes
9	10	JUHI MUKHERJEE	Chandigarh	General	Yes
10	11	BISHNU CHARAN MALLICK	Orissa	S.C.	Yes
11	12	DEEPAK RAWAT	Uttaranchal	General	Yes
12	13	NILA MOHANAN	Kerala	General	Yes
13	14	JAI SINGH	Uttar Pradesh	General	Yes
14	15	MOUMITA BASU	West Bengal	General	Yes
15	16	SHAMMI ABIDI	Uttar Pradesh	General	Yes
16	17	REMYA MOHAN MOOTHADATH	Kerala	General	Yes
17	18	SHRIMAN SHUKLA	Madhya Pradesh	General	Yes
18	19	SHEETAL VERMA	Uttar Pradesh	S.C.*	Yes
19	20	SHAINAMOL A	Kerala	O.B.C*	Yes
20	21	YASHA MUDGAL	Rajasthan	General	Yes
21	22	ATUL KUMAR	Haryana	General	Yes
22	23	SHUCHI TYAGI	Uttar Pradesh	General	Yes
23	24	ANURAG TEWARI	Uttar Pradesh	General	Yes
24	25	UDIT PRAKASH	Uttar Pradesh	General	Yes
25	26	SACHINDRA PRATAP SINGH	Uttar Pradesh	O.B.C	Yes

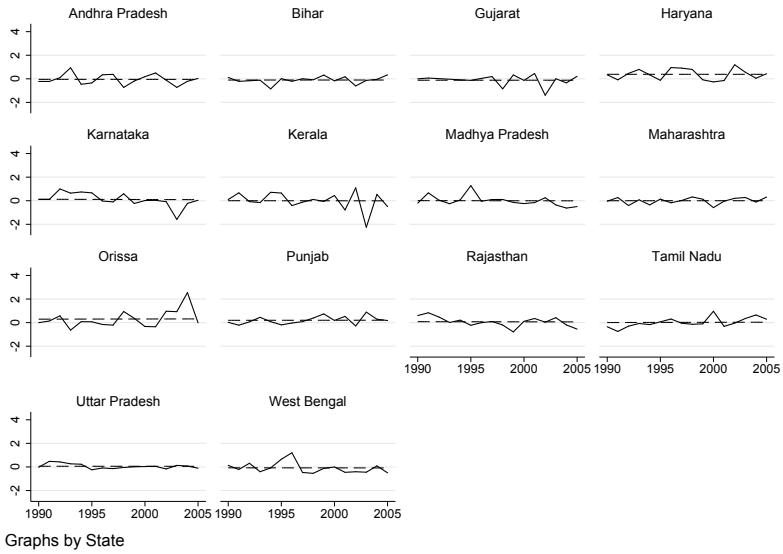
Notes: Illustrating the ranking of candidates using the intake year of 2006. Candidates in a given year of intake are ranked in descending order based on the UPSC entry exam score. Home state denotes the state from which the candidate applied from. Category denotes the caste of the candidate, where O.B.C. denotes other backward castes, S.C. scheduled castes, S.T. scheduled tribes and General the unreserved castes. Whether home state opted denotes if the applicant indicated a preference to be allocated to the home state.

Figure B5: Rotation of state groups over years



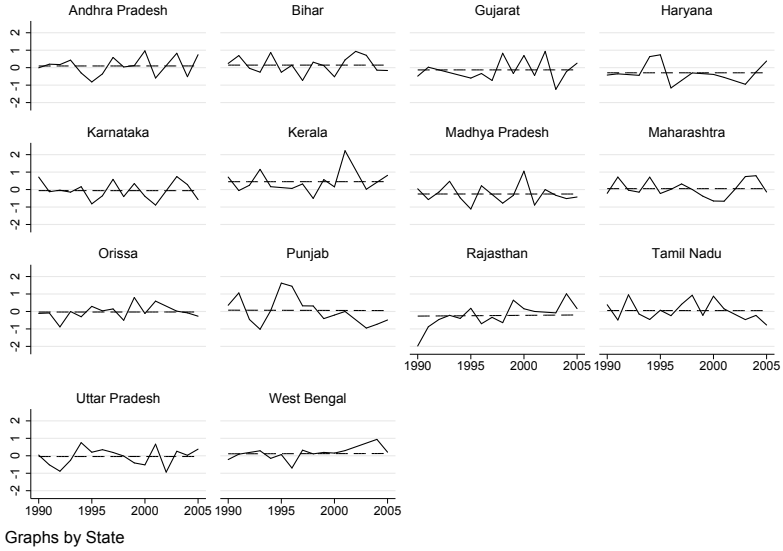
Notes: Division of state cadres into four groups and the rotation of groups in the order of IAS officer allocation over time, as illustrated by the group order in 2006. The groups of states rotate each year. In 2007, for example, the order changes to Group II, Group III, Group IV, Group I.

Figure B6: Quasi-random allocation across states: UPSC (entry) score



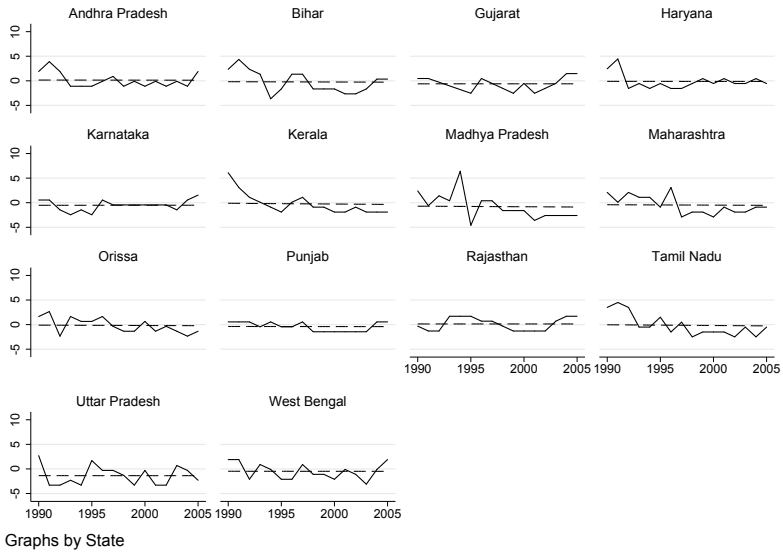
Notes: Average UPSC score of IAS officers (standardized relative to their year of intake) allocated to states 1972-2009. The trend line is fitted as a non-parametric local polynomial.

Figure B7: Quasi-random allocation across states: Age at entry



Notes: Average age at entry of IAS officers (standardized relative to their year of intake) allocated to states 1972-2009. The trend line is fitted as a non-parametric local polynomial.

Figure B8: Quasi-random allocation across states: Cohort size



Notes: Average number of officers, i.e. the cohort size (standardized relative to the state average) allocated to states 1972-2009. The trend line is fitted as a non-parametric local polynomial.

C1 Allocation rule

Key to our empirical analysis is the rigid rule that determines the allocation of IAS officers and the cohort sizes of each state's intake. Here, we briefly summarize the allocation rule. A detailed documentation can be found in the IAS guidelines.[32] Coinciding with our sample period, we focus on the pre-2008 allocation rule, paying particular attention to the sources of variation that give rise to the observed quasi-random allocation of IAS officers across cadres.

After entering the IAS following the UPSC exams, centrally recruited IAS officers are allocated to 24 cadres. These cadres typically map directly into the Indian states. Smaller states, however, are grouped into three joint cadres, which are Assam-Meghalaya, Manipur-Tripura and AGMUT (Arunachal Pradesh, Goa, Mizoram and Union Territories (Delhi). We did not survey states with pooled cadres due to logistical constraints. The cadres we study therefore map directly onto the 14 major states which contain the majority of India's population.

The allocation process can be broadly divided into three steps: In the first step, IAS applicants are asked to declare their preference to remain in their home state (referred to as "insider" preference). In the second step, the overall number of vacancies and the corresponding quotas for castes and "insiders" are determined. In the final step, vacancies and officers are matched in the actual allocation process where merit (as defined by the ranking in the UPSC entry exam), caste status and locational preferences are all taken into account. The interplay of idiosyncrasies in each of these steps gives rise to the observed quasi-random allocation of IAS officers across cadres.

Step 1. IAS officers can declare their cadre preferences by first stating their preference to remain in their state of residence. Nearly all IAS officers exercise this option. The declared preferences however do not guarantee the actual allocation: only 7.5% of all IAS officers are allocated to their home state. The actual allocation depends on the availability of vacancies.

Step 2. The total number of vacancies is determined by the state government with the Department of Personnel and Training. Typically, the overall number of vacancies in a given year depend on the shortfall from the total number of IAS officers designated to a state (the cadre strength). This cadre strength is defined by the "cadre strength fixation rules", whereby larger states are assigned more IAS officers. These rules are seldom revised so the designated state cadre strength is fixed over longer periods. The vacancies are then broken down by quotas on two dimensions: caste and home preference. There are three categories for castes: General (unreserved) caste, Scheduled Caste/Tribes (SC/ST) and Other Backward Castes (OBC). The designation of vacancies to these caste categories are made based on predefined national quotas. The actual assignment of each vacancy to a caste is randomized using a rotating roster. In terms of preferences, vacancies are broken down into

[32] For full details, refer to the original official notifications 13013/2/2010-AIS-I, 29062/1/2011-AIS-I and 13011/22/2005-AIS-I published by the Department of Personnel and Training, Ministry of Personnel, Public Grievances and Pensions, Government of India.

"insider" and "outsider" vacancies. Insider vacancies are to be filled by IAS officers from the same state who declared their home state preference at time of application. The ratio of insider to outsider vacancies is 1:2, with the assignment of vacancies to "insider" or "outsider" category following the repeating sequence O-I-O. The determinantion of vacancies is illustrated in Appendix Figure B2. The result of this procedure is a list denoting the number of vacancies for each state and the corresponding quotas by caste status (SC/ST/OBC) and home state (insider/outsider) as shown in Appendix Figure B3.

Step 3. The final allocation process is based on merit as determined by the ranking in the UPSC entry exam, the vacancies available and the preference stated.

Before the officers are allocated, the candidates are ranked and assigned a serial number in the order of merit, as determined by the UPSC exam. Appendix Figure B4 shows this ranking along with the officers' caste and home preference. The highest scoring candidate for the 2006 intake, for example, was Mutyalaraju Revu who belongs to the OBC category and indicated his preference to be assigned to Andhra Pradesh.

The allocation proceeds sequentially. First, the insider vacancies are allocated as far as exact matches along caste and home state preference permit. If the number of matches exceed the vacancies, the higher ranking IAS officer is given preference. Given the exact match along caste and home state required for slotting, however, many insider vacancies typically remain unfilled. In this case, the caste requirement is successively relaxed. In presence of open unreserved insider vacancies, the unreserved insider vacancy can be allocated to insider IAS officers from SC/ST and OBC (following the exact order) if there is an SC/ST (or OBC) outsider vacancy to allow for the exchange: For example, if Gujarat has received two unreserved insider vacancies but only one Gujarati general caste to fill the first slot, the second slot is opened to Gujarati SC/ST insiders, and if those are not available, to OBC insiders. The reallocation, however, is only permitted when there is a corresponding outsider vacancy that can be converted to an unreserved outsider vacancy to maintain the quota among the caste vacancies. A Gujarati insider SC/ST then can only fill the unreserved insider vacancy if a SC/ST outsider vacancy is available for exchange. Similar rules apply for unfilled SC/ST or OBC insider vacancies. Open SC/ST insider vacancies that could not be filled are first relaxed to allow for OBC insider candidates and then to general candidates. Open OBC vacancies, similarly, can first be filled by SC/ST insider candidates and then by general candidates (in both cases provided there is a corresponding outsider slot for exchange). Any remaining open insider vacancies that could not be filled despite the relaxation of the quotas are converted to outsider vacancies to ensure all vacancies are filled.

The allocation of the outsiders and those who failed to be allocated to their preferred home state (and are consequently converted to outsiders) is done according to a rotating roster system. The roster is created by arranging all 24 cadres in alphabetical order and dividing them into four groups. These groups are devised on the basis of an average intake by each group, which over a period of time is roughly equal:

1. Group I: Andhra Pradesh, Assam-Meghalaya, Bihar, Chhattisgarh and Gujarat

2. Group II: Haryana, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Karnataka, Kerala and Madhya Pradesh

3. Group III: Maharashtra, Manipur-Tripura, Nagaland, Orissa, Punjab, Rajasthan and Sikkim

4. Group IV: Tamil Nadu, AGMUT (UT Cadre), Uttaranchal, Uttar Pradesh and West Bengal

The outsider candidates are allocated in the order of merit across the four groups for the outsider available vacancies (including those that have been converted from insider vacancies). In the first cycle, all candidates are allocated to their matching caste vacancy in the four states of Group I, starting with Andhra Pradesh. In the second cycle, the remaining candidates are allocated to their matching caste vacancies in Group II and so on. Since states who receive officers earlier in the allocation process will receive higher ranked recruits, the order of the groups shuffles each year to ensure that all states receive officers of comparable quality. In Appendix Figure B5, for example, Group III is the first group in 2006, followed by Group IV, Group I and Group II. In the subsequent year, the groups will rotate and the allocation of outsiders will commence with Group II first, followed by Group III, Group IV and Group I.