Enfranchising Your Own? Experimental Evidence on Bureaucrat Diversity and Election Bias in India

Yusuf Neggers*

March 9, 2017

Abstract

This paper investigates the effects of bureaucrat bias on elections in India, using a natural experiment—the random assignment of government officials to teams managing polling stations on election day—together with surveys and experiments conducted with voters and election officers. I provide evidence of own-group favoritism in the decisions of election personnel. I also show that minority officer absence from teams makes it more difficult for minority individuals to vote and reduces the minority-oriented coalition's vote share, at a magnitude large enough to influence election outcomes. Effects are strongest when officers have greater discretion over the voting process.

JEL Codes: C93, D02, D72, K42, O17

*Brown University. Email: yusuf_neggers@brown.edu. I am very grateful to Alberto Alesina, Rema Hanna, Rohini Pande, and Andrei Shleifer for their extensive feedback over the course of this project. I also thank Daniel Björkegren, Leonardo Burzstyn, Michael Callen, Shawn Cole, Melissa Dell, Andrew Foster, John Friedman, Clément Imbert, Asim Khwaja, Michael Kremer, Horacio Larreguy, Nathan Nunn, Benjamin Olken, Vincent Pons, Gautam Rao, Natalia Rigol, Jesse Shapiro, Monica Singhal, Bryce Millett Steinberg, Andrew Weiss, Jeff Wittsoe, David Yanagizawa-Drott, and participants of the Harvard development and political economy seminars and the NEUDC and ISI Delhi conferences for helpful comments. Shruti Bhimsaria, Azfar Karim, and Akhilesh Kumar provided excellent research assistance. I am grateful to Shashi Thakur, Eric Dodge, Jeffrey McManus, and Ista Zahn for assistance with administrative data acquisition. The field work would not have been possible without the hospitality of the IDinsight Bihar office and the effort of staff at J-PAL South Asia, MORSEL India, and Sunai Consultancy. Financial support for this project was generously provided by the J-PAL Governance Initiative, Harvard Lab for Economic Applications and Policy, Weiss Family Program Fund, Pershing Square Venture Fund for Research on the Foundations of Human Behavior, Harvard South Asia Institute, and Harvard Institute for Quantitative Social Science.

1 Introduction

While both theoretical and empirical work have emphasized the importance of state capacity for economic development (Besley and Persson 2010, Acemoglu et al. 2015, Muralidharan et al. 2016), a nascent experimental literature has identified more specifically the importance of the behavior of local-level state personnel (Finan et al. 2015), who can in their actions influence the realization of government policies. One such channel of influence is that it is often necessary in the course of their duties for these bureaucrats to use discretion in decisions that can impact which members of the public receive access to government services. As discrimination along dimensions such as ethnicity and religion has been documented in a wide variety of contexts (Bertrand and Duflo 2016), own-group bias in decision making by local government personnel is an underexplored potential mechanism through which the quality of public service provision may be undermined.[1] Better understanding the circumstances under which this discrimination occurs, and how it can be mitigated, is therefore valuable.

In this paper, I provide novel experimental evidence in the context of India that religious and caste diversity in the composition of bureaucrat teams positively impacts the provision of elections, a public service critical to maintaining the accountability and responsiveness of elected officials to their constituents (Besley and Case 1995, Besley and Burgess 2002, Maskin and Tirole 2004, Ferraz and Finan 2008, among others). I first demonstrate the existence of own-group bias in the discretionary decision making of local election officials. I then show that voting outcomes at polling stations change in response to the composition of the officer teams who manage them on election day, in patterns consistent with such bias, and that the magnitudes of the observed effects are large enough to be relevant to the outcomes of elections. Finally, I provide individual-level evidence that the differential treatment of minorities at polling stations is reduced through two different means: the presence of minority officers on teams, or a reduction in the scope for officer discretion in the election administration process.

Convincingly estimating the impacts of team composition is typically challenging due to the potential for confounding selection in the placement of officials at polling stations. A government may assign election personnel with greater experience to manage more troubled

[1]The potential for bias in discretionary decision-making has been considered in the political science literature on bureaucracy, for example, Jones et al. 1977 and Lipsky 1980.

locations in an effort to maintain neutrality or, alternatively, the ruling party may station supporters as officers in strategically important areas to influence outcomes in their favor. In either case, the assignment of officers would be endogenous to voting behavior. Circumventing issues of this type, I take advantage of a natural policy experiment occurring during the 2014 Indian parliamentary elections in which state personnel were randomly assigned by the government to the teams managing polling stations on election day, generating exogenous variation in the religious and caste composition of these groups. An additional benefit of the study context is that the polling officer assignment policy had already been in place statewide for a decade at the time of the elections under consideration, alleviating concerns that the estimated impacts reflect only partial equilibrium effects that may disappear once the policy is brought to full scale or as the government and political parties adjust to the change over time (Acemoglu 2010, Svensson and Yanagizawa-Drott 2012).

The 2014 national parliamentary elections involved as a whole more than 8 million election officers and security personnel interacting with roughly 800 million voters. The total cost to the government of administering these elections has been estimated at more than $1.2 billion USD (Press Trust of India 2014). I study two districts in the large Indian state of Bihar covering more than 5.6 million registered voters across 5,561 polling stations for the 2014 national elections. Religious and caste identity were highly relevant to political affiliation in this setting: largely in opposition to upper-caste Hindu influence, two minority groups, Muslims and Yadavs (a lower-caste Hindu group), formed an alliance in the mid-1990s that has constituted the core of one of the two major political coalitions in the state for the last two decades.[2]

The teams of officers in the study area contained at least one minority individual approximately one third of the time and, given the low proportions of Muslims and Yadavs among officers, no fully minority teams were observed. I am therefore able to identify the causal impacts of having teams with any minority group officers present ("mixed team") versus not ("homogeneous team") at polling stations. I supplement the policy experiment with survey-based experiments conducted with more than 5,100 individuals randomly selected from the same populations of local-level election officers and potential voters that

[2]Wittsoe (2013) provides a detailed account of the state of the alliance over time.

participated in the 2014 elections.[3]

I first employ a vignette experiment to generate a measure of bureaucrat own-group bias in discretionary decision making. Polling station officials assessed the likelihood that a hypothetical individual would be allowed to vote, based on a description where all information was held constant across respondents with the exception of a randomly assigned name. Officers are 10 percentage points, or 25 percent, more likely to favorably assess qualification to vote when they are of the same religious/caste-group type as the potential voter being considered.

Using unique administrative data on officer assignment from the natural policy experiment and precise polling station location information, I next identify the causal effects of changes in team composition on voting outcomes. The average vote share margin between the two major political coalitions shifts toward the minority-oriented coalition by an average of 2.3 percentage points, or 12.7 percent, when the team at a given polling station includes a minority officer. This shift is driven by a significant 4.6 percent increase in votes for the minority-oriented coalition and a 4.1 percent decrease in votes for the opposing coalition. Further, the presence of a minority officer at a closely neighboring station shifts the vote share margin at a given polling station toward the minority-oriented coalition by an average of 2.6 percentage points, demonstrating that omission of cross-station spillovers would lead to an underestimate of the total impact of team diversity. In addition, the effects of team composition on voting outcomes are concentrated in areas where fewer individuals possess voter identity cards, which increases the scope for officer discretion in the judgment of voter eligibility.

Third, I turn to individual-level evidence on the election day experiences of potential voters. List randomization experiments show that approximately 23 percent of potential voter respondents indicate that officers on election day treated the public differently based on religion or caste, and 13 percent that officers attempted to influence voting behavior. Using additional survey data, I also find that, as compared to non-minorities, Muslim/Yadav individuals at polling stations with no minority officers are significantly less likely to be allowed to vote and express significantly lower satisfaction with their election day station experiences. These religious- and caste-based differences disappear, however, when either polling station team composition is mixed or an individual possesses a voter identity card.

[3]"Potential voter" refers to a registered voter who went to the polling station with the intention to vote.

Taken together my results provide strong evidence that own-group bias influences bureaucratic decision making in a manner which undermines the impartial provision of elections, but also that this discriminatory behavior can be mitigated through two different means – diversity within officer teams or reduced scope for discretion in officer duties.

The estimated effects of own-group bias are large. Counterfactual calculations suggest that alternative officer assignment mechanisms would have changed the identity of the winning coalition in more than 8 percent of races in recent national and state elections in Bihar. In addition, these changes in election outcomes would have led to roughly an 18 percent increase in Muslim officeholders, where recent work finds that the election of Muslim legislators in India significantly improves child health and education outcomes for both Muslim and non-Muslim households (Bhalotra et al. 2014).

This paper contributes to and bridges a number of areas of economics research. A small body of field experimental work investigates the impacts of ethnic diversity on the performance of organizations and society more generally, where the studies in this area have focused on the productivity of teams in private sector settings (Hoogendoorn et al. 2013, Hjort 2014, Marx et al. 2015).[4] Another emerging literature uses field and natural experiments to improve our understanding of the personnel economics of the state in developing country settings (Finan et al. 2015, Bertrand et al. 2016). To my knowledge, this paper is the first to provide experimental evidence in a developing country setting of the existence of own-group bias in the decision making of front-line public sector employees and its adverse impacts on the quality of service delivery.[5] Further, my results demonstrate a positive channel, the reduction of discriminatory behavior, through which team diversity can influence the performance of groups of public sector personnel.

My findings are also relevant to an established literature that has studied the negative impacts of societal ethnic fractionalization on the quality of government decision making and the provision of public goods (Easterly and Levine 1997, Alesina et al. 1999, Alesina and Ferrara 2005, Miguel and Gugerty 2005, Habyarimana et al. 2007, Banerjee and Somanathan 2007). I provide micro-econometric evidence on an additional area, the administration of elections, in which heterogeneity in the ethnic composition of a population

[4]Rasul and Rogger (2015) show a positive correlation between ethnic diversity in bureaucracies within the Nigerian Civil Service and public service delivery, in terms of higher project completion rates.

[5]Burgess et al. (2015) provide evidence of district-level ethnic favoritism in roads expenditure and construction associated with presidential identity in Kenya. The contribution of this paper is distinct in examining impacts of the identities of local-level state personnel, independent of those of elected officials.

can lead to adverse effects on public services.

In addition, while a sizeable literature examines the potential for discrimination against minorities in the judicial system (Glaeser and Sacerdote 2003, Shayo and Zusman 2011, Abrams, Bertrand, and Mullainathan 2012, Alesina and La Ferrara 2014, McConnell and Rasul 2016), this paper extends consideration to the electoral process of the potential negative effects of own-group bias on the decision making of government officials interacting directly with the public. In doing so, it also relates to a body of work that studies possible discrimination against blacks and Hispanics in the American electoral system and suggests that minorities receive lower quality information about voting requirements from local election officials prior to elections and have different procedural experiences at polling stations on election day (Atkeson et al. 2010, Cobb et al. 2012, White et al. 2015).[6]

The paper proceeds as follows. The next section describes the institutional background and the predicted effects of changes in officer team composition. Section 3 describes the data and performs randomization checks. Section 4 presents the empirical strategies and results, followed by a discussion of potential alternative mechanisms. Section 5 concludes.

2 Background

2.1 Election administration and randomized officer assignment

The state of Bihar, with a population of roughly 100 million, is divided into 40 parliamentary constituencies (PCs), single member jurisdictions electing representatives to the national parliament via plurality rule. These PCs are further sub-divided into 243 assembly constituencies (sub-constituencies), which contain roughly 250 polling stations each on average.[7] Registered voters are assigned to a specific polling station and can only cast a vote at that location. Parallel to the electoral structure, the state's bureaucratic structure is divided into 38 districts, where PCs and districts may, but do not always, fully coincide.[8]

[6]This paper additionally complements an economic literature examining technology-centered approaches to strengthening the electoral process. While technological innovations in the election setting have been shown to significantly impact electoral fraud, voter turnout, and even subsequent public service delivery and health (Callen et al. 2015, Fujiwara 2015, Aker et al. 2017), less progress has been made in understanding, holding the electoral setting otherwise constant, how election personnel identities matter.

[7]Assembly constituencies each elect a representative to the state assembly during an election cycle distinct from that of national elections in Bihar.

[8]District administrators are responsible for managing election personnel assignment in those sub-constituencies falling within their districts.

A polling station is managed on election day by a presiding officer and typically three or four polling officers with distinct administrative responsibilities, detailed below.[9] Each polling team position is staffed from a distinct district-level pool of state government employees.[10] No more than seven days before election day, each district uses a government software program to randomly assign individuals from the position-specific pools to positions on polling officer teams in designated sub-constituencies.[11] Officers are not assigned to sub-constituencies where they are registered to vote or are employed full time. The second stage of the software-based randomization, in which the officer teams are assigned to specific polling stations, occurs the day prior to deployment of teams, timed so that they arrive the night before the election and no one has advance knowledge of who the officers at a given polling station will be.[12] The software also automatically generates team rosters with photographs. Section 3.4 tests the validity of the randomization procedure.

Polling station officials are transported together in teams from the district headquarters to their polling stations. Together with the automated generation of officer rosters with photographs, this increases the difficulty of officers subverting their assignments by, for example, being absent, reporting to a different polling station, or having someone else impersonate them. In addition, if officers are found not to have properly completed their assigned duty, they are subject to punishment by the ECI. However, it may still be that some proportion of officers do not report to their assigned polling stations on election day.[13] To the extent that this occurs, the estimates in this paper can be interpreted as intent-to-treat effects given that I use the initial randomized assignments throughout.

On election day, potential voters wait in line at their assigned polling station and sequentially interact with the first through third polling officers. Each individual is required

[9]Four polling officers are assigned to polling stations with greater than 1200 registered voters in rural areas and 1400 registered voters in urban areas (21.1 percent of polling stations), and only two polling officers are assigned to polling station with fewer than 500 registered voters (0.7 percent of polling stations). With four polling officers, the fourth polling officer shares the duties of the second officer. With two polling officers, the presiding officer additionally assumes the duties of the third polling officer.

[10]Given the high number of officers needed, the large majority of these individuals in their regular duties work in relatively low-ranking government positions such as school teacher or office clerk.

[11]The randomization is conducted in the presence of official observers assigned by the national office of the Election Commission of India (ECI).

[12]The randomized assignment of officers and polling station teams has been employed statewide in Bihar beginning in 2004, and has since been adopted nationwide, covering more than 814 million registered voters across 543 parliamentary constituencies.

[13]Official attendance data is not available, but the election officer survey results indicate that officers are absent from duty very infrequently.

to verify her identity against the official list of registered voters at that station before being allowed to enter the booth and cast her vote on an electronic voting machine (EVM).[14] Potential voters at the polling station do not necessarily interact with the presiding officer, who is tasked with the overall management and supervision of station activities.

2.2 Religion, caste, and politics

Over the last two decades, the dominant political parties in state-level politics in Bihar have been the Rashtriya Janata Dal (RJD), Bharatiya Janata Party (BJP), and Janata Dal United (JDU). The RJD has traditionally enjoyed the support of an alliance between Muslims and Yadavs, a lower-caste Hindu group, which arose in large part in the mid-1990s in an attempt to counter upper-caste Hindu influence in the state (Wittsoe 2013). Muslims and Yadavs are sizeable constituencies in Bihar, making up approximately 17 percent and 14 percent of the population of registered voters, respectively (CSDS 2010). Between 2005 and 2013, the BJP and JDU parties were joined in a political alliance, where the BJP was primarily supported by upper-caste Hindus and the JDU relied more on the support of non-Yadav lower castes. The BJP-JDU alliance dissolved in the run up to the 2014 parliamentary election and religion and caste were widely considered of high electoral relevance (Anuja 2013, Rukmini 2014).

The RJD and BJP subsequently each formed coalitions with other political parties, where members within each coalition agreed prior to the elections not to field candidates in the same races. As upper-castes are less than 15 percent of the population in Bihar, the BJP increased its efforts to court lower-caste Hindu voters (Kumar 2014a). Post-polls for the 2014 elections indicate that only 19 percent of Muslims and 2 percent of Yadavs voted for the BJP coalition, while approximately 78 percent of upper-caste Hindus and more than 50 percent of other lower-caste groups did so. Correspondingly, only 5 percent of upper castes and 10 percent of other lower-caste groups, but roughly 64 percent of both Muslims and Yadavs, voted for the RJD coalition (Kumar 2014b).

Given the strong connections between religious and caste identity and party affiliation,

[14]The first polling officer verifies each individual's identity against the electoral roll. The second polling officer then stamps her finger with ink, obtains her signature or thumb impression in the official register, and gives her a paper slip with a serial number designating the order in which the voting compartment may be entered. The third officer then checks her finger for ink, allows her into the voting compartment, and activates the EVM so that a single vote may be cast.

non-Muslim/Yadav officials are expected on average to be relatively politically inclined toward the BJP coalition over the RJD coalition, and vice versa for Muslim/Yadav officers. The following section discusses the mechanisms through which a shift from a homogeneous to mixed polling officer team may influence voting outcomes. I hereafter refer to the coalitions as simply the RJD and the BJP.

2.3 Team composition: channels of influence

The adoption of randomization was largely motivated by a desire to weaken political parties' ability to identify which locations would be the easiest targets for "booth capturing", in which a polling station comes under the control of a political party on election day.[15] In combination with a number of other ECI initiatives,[16] the policy is generally viewed as having been successful in preventing outright booth capturing. Issues potentially remain, however, of more subtle forms of biased election officer behavior on election day.

2.3.1 Within-station effects

In a setting where officers may engage in biased behavior at the polling station, a change from homogeneous to mixed team composition may influence voting outcomes through a "checks and balances" channel. Polling station officials have two sets of duties on election day: administration of the identity verification and voting process; and maintenance of a neutral environment in the area immediately surrounding the station. In addition, the connection of religion and caste with political affiliation is well known in this setting and potential voter type is observable to election officers.[17]

Relative to a benchmark homogeneous team of officials, whose biases and preferences are more likely to be aligned, mixed team composition may increase the probability of detection and punishment of team members that discriminate in their administrative duties, reducing

[15]Booth capturing was a widespread occurrence as recently as the 2004 national elections (Rohde 2004). Methods range from relatively peaceful, with local leaders standing near the voting machine to instruct voters on their choice of candidate and making their decisions public, to violent, with armed individuals taking control of a polling station to cast false votes or steal the ballot box (Wittsoe 2013).

[16]Elections may be staggered over multiple weeks across different regions within a state to maximize the available coverage of central police and paramilitary forces, observers, and camera recording equipment at sensitive locations. Additionally, EVMs, which were first used in Bihar during a 2004 nationwide rollout to all state and national assembly elections, were adopted under the general assumption that they are more secure than the traditional paper ballot.

[17]During the identity verification process, the first polling officer reads each potential voter's name aloud.

the likelihood of such behavior. Officers within a team are stationed in close proximity, typically sitting directly adjacent to one another (see Appendix Figure A1). Observability of actions across team members is therefore high and officers can lodge complaints to the ECI directly, with potentially severe career consequences for offending officials. Mixed team composition may also reduce the probability that a given attempt at influencing voting on election day is successful, further weakening officer incentives to discriminate.

The verification of voter identity that occurs prior to voting necessarily involves discretion in the decision making of election officials. The judgment calls involved in this process may allow officers to influence voting outcomes with a lower probability of punishment as compared to actions that can be identified as improper with greater certainty.[18] This step then may be particularly susceptible to biased officer behavior, resulting in the disenfranchisement of qualified potential voters or enfranchisement of unqualified individuals.

The scope for officer discretion in the identity verification process, however, is heavily influenced by the identification documents that potential voters possess. The government-issued voter identity card is the officially preferred and least controvertible form of identification (Appendix Figure A2 provides an example card). While eleven other sets of documents are allowed on election day, potential voters may be less certain about the details of the rules surrounding their use, making them less likely to dispute judgments regarding qualification to vote or increasing their susceptibility to influence in choice of candidate (e.g. if they feel they are receiving a favor in being allowed to vote). The shift from homogeneous to mixed team composition may therefore be particularly important in environments where voter identity cards are less common.

Officers are also responsible for maintaining a neutral environment in the area immediately surrounding their polling station—any activities which may influence potential voters, such as canvassing of votes by party agents or disorderly behavior, are officially prohibited within one hundred meters. If mixed team composition weakens the incentives of officers to behave with bias, the likelihood that agents from both coalitions are prevented from violating neutrality could increase.

In sum, if a homogeneous officer team behaves with bias relatively favoring one coalition, shifting to a mixed team would be expected to decrease votes for the previously favored

[18] Guidelines from the ECI on election day management of polling stations even state that "minor errors in the EPIC [voter identity card] and electoral roll may be ignored and overlooked."

coalition (here the BJP) and/or increase votes for the other coalition (here the RJD), with ambiguous predictions on total votes cast.

2.3.2 Cross-station externalities

The presence of minorities on an officer team may also affect other stations, especially given that stations can be located within short distances of one another (see Figure 1 and Appendix Figure A3). Accounting for the possibility of these cross-station effects is important when determining the total impact of changes in team composition, as their exclusion could bias the overall estimates downward or upward.

If a polling station is more strictly managed in terms of maintaining a neutral environment under mixed officer composition, the ability of local political agents to influence proceedings there may be reduced. These individuals could then intensify their focus on other stations that are more amenable to their activity, leading to "displacement effects" (Ichino and Schündeln 2012) that reduce the magnitude of the total impact on voting outcomes. Alternatively, the effects of more impartial management could spill over positively to nearby stations. The presence of officers of different types on teams in close proximity may serve a monitoring role as within teams, or informational spillovers about what constitutes sufficient documentation for identity verification could take place across potential voters in neighboring polling stations. In such cases, mixed team composition may yield additional "chilling effects" (Callen and Long 2015) in the same direction as the within-station impacts, increasing the magnitude of the total effect. It is also possible that both displacement and chilling effects occur, but over different distances from a given polling station, where chilling effects would be expected to occur across polling stations in closer proximity and displacement effects could take place over longer distances.

3 Data and identification check

3.1 Administrative data

In order to measure the effects of officer religious/caste identity, I acquired unique administrative data on polling station officials for two districts in Bihar for the 2014 elections, covering 23,384 officials posted across 5,561 polling stations. The data include officer name,

team and position assignment, and, for one of the two districts, age and monthly salary.

In addition, I use polling-station-level electoral returns from the Office of the Chief Electoral Officer (CEO), Bihar. The main outcomes of interest generated from this data are the log votes received by each of the two main coalitions and cast in total, and the vote share margin between the coalitions. Sub-constituency-level measures of voter identity card possession were also acquired from the Office of the CEO.

Due to political sensitivity, religious composition statistics are not released by the government below the sub-district level. I therefore generated new measures of electorate religious and caste composition at the polling-station level, scraping publicly available online lists of registered voters covering the approximately 5.6 million individuals in the two districts for which officer assignment data was available and applying the religious/caste inference procedure described in the next section.

For the analysis of cross-station externalities, I use polling station GPS coordinates from the dataset of Susewind (2014). As polling station identifier numbers change across elections and those in the dataset reflect the 2010 election cycle, stations were then hand matched by name, achieving a 94.5 percent match rate. The non-matches come almost entirely from new polling stations created due to increases in the number of registered voters between elections. I also use 2011 census village shapefiles acquired from ML InfoMap to match polling stations to villages.

3.2 Inference of religious and caste identity

Election officers and registered voters are categorized as Muslim or Yadav based on name. The Anthropological Survey of India's *People of India* (POI) series lists common surnames as well as religion and caste for 261 distinct communities identified as inhabiting Bihar. As surnames may be associated with multiple communities, potentially of different religious or caste affiliations, individuals are categorized as Muslim if their surnames match one listed in the POI that is associated only with Muslim communities. Individuals are also identified as Muslim if their name has components of clear Islamic origin, e.g., "Ahmad" or "Mohammed". I categorize as Yadav those individuals with the surname "Yadav", as a large majority of the members of the caste are so named and the surname is not associated with other communities. The lists of registered voters available for each polling station provide the name of a relative for each individual (typically a father in the case of males

or unmarried females, and husband in the case of married females) as well. Given strong norms of marrying within religion and caste group in the region, registered voters are also categorized as Muslim or Yadav if their listed relative was inferred as falling into one of these categories.

I use the inferred type in categorizing polling station team composition, where polling stations with at least one Muslim or Yadav officer are defined as "mixed" as opposed to "homogeneous" team, and for the random sampling of individuals for the surveys of election officers and potential voters. To the extent that officers are misclassified, estimates of the impact on voting outcomes of Muslim/Yadav presence on polling station teams will be biased toward zero. For surveyed individuals, a self-reported measure of Muslim/Yadav identity is available and used in the analyses based on survey data.[19]

3.3 Survey data

Between May and September 2015, I fielded surveys of potential voters and election officers from the 2014 elections to gather information on socio-demographic characteristics and election-related experiences. Experimental modules, discussed in more detail in Section 4, were additionally included to generate experimental measures of officer bias. The surveys were conducted in one of the two districts for which officer assignment data was available.

For the survey of potential voters, 4,320 individuals across 360 polling stations were sampled. In each of the 5 sub-constituencies in the district, 36 mixed and 36 homogeneous team polling stations were randomly selected, additionally stratifying by whether the Muslim/Yadav proportion of the electorate was above or below the district-level median.[20] For each of these polling stations, three Muslims and two Yadavs were randomly chosen from the list of registered voters, if possible, along with seven randomly selected individuals inferred as neither Muslim nor Yadav. Randomly drawn backup respondents were also identified for each primary respondent. If an individual could not be located, refused consent, or indicated that they did not go to the polling station to attempt to vote on election day, the next backup individual was then substituted. A total of 4,243 individuals who went to the polling station with the intent of voting were reached and provided consent.

[19]The inferred and self-reported measures of Muslim/Yadav status align more than 90% of the time.

[20]To increase the likelihood that the necessary numbers of Muslim and Yadav respondents could be surveyed, 34 of each 36 polling station set were chosen from the population of stations with at least 30 Muslim/Yadav registered voters.

A total of 915 officers across 610 polling stations were sampled for the survey of election officers, with 61 mixed team and 61 homogeneous team polling stations in each of the 5 sub-constituencies chosen randomly. One Muslim or Yadav officer and one non-Muslim, non-Yadav officer were randomly selected from each mixed team, while a single non-Muslim, non-Yadav officer was randomly chosen from each homogeneous team. A total of 864 officers were able to meet and provided consent to be surveyed. The rate of survey completion does not vary significantly by team composition for either survey.[21] Appendix B provides additional sampling methodology details for both surveys.

3.4 Identification and balance checks

In the two sample districts, between 8.3 and 9.3 percent of officers in each team position are Muslim/Yadav, yielding 32.4 percent of polling stations with at least one Muslim/Yadav officer (i.e. mixed team).[22] As officers within a district are not assigned to sub-constituencies in which they are registered to vote or work full time, a sub-constituency with a larger population proportion of minority officers relative to other constituencies within the same district, for example, could then receive a lower proportion of minority officers assigned to its polling stations, mechanically leading to correlations between team composition and voting outcomes. However, it is still the case that each polling station *within* a sub-constituency is equally likely to have minority officials posted to the officer team. I therefore exploit only within-sub-constituency variation in team composition by including sub-constituency-level fixed effects in my subsequent analysis. In addition, because the likelihood of minority presence on a team is increasing in the number of officers on a team, which is determined by the number of registered voters assigned to the polling station, I include fixed effects for team size.

As a check of the validity of the government's implementation of the random assignment, I examine whether polling stations with mixed composition teams differ significantly across a set of pre-election characteristics potentially correlated with voting outcomes, using the specification:

$$Y_{pc} = \mu_c + \theta_o + \beta Mixed_{pc} + \epsilon_{pc}, \tag{1}$$

[21] Coefficients from polling-station-level regressions of the rate of survey completion on a mixed team indicator are -0.013 (p-value = 0.177) and 0.008 (p-value = 0.631) for the voter and officer surveys.

[22] 27.7 percent with a single Muslim/Yadav officer, 4.4 percent with two, and 0.3 percent with three.

where Y_{pc} is an outcome of interest at polling station p in sub-constituency c, μ_c are sub-constituency-level fixed effects, and θ_o are fixed effects for the number of team members. $Mixed_{pc}$ is an indicator variable taking value 1 if at least one polling team member is Muslim/Yadav and 0 otherwise. I also use this approach to test for balance in characteristics of the random samples of surveyed potential voters and election officers across polling station type.

In Panel A of Table 1, I consider whether the size or composition of the electorate differs across homogeneous and mixed team polling stations. The average polling station has roughly 1,000 registered voters of which 46 percent are female and 13 percent are Muslim or Yadav, with no significant differences by team composition. In Panel B, I examine station-level electoral results from the previous 2010 elections to the state assembly. As the number of polling stations increases over time due to growing numbers of registered voters, it is not possible to fully match polling stations across elections.[23] For each 2010 election-related variable, I therefore take the average value across all polling stations within the same immediate location in 2010 and assign it to each polling station in that location in 2014.[24] Additionally, a small proportion of polling stations were established in new locations for the 2014 election and so cannot be matched to previous elections. I observe no significant differences in the log votes previously received by either coalition or in total, or in the vote share margin between the coalitions.[25]

Panel C tests for differences by team composition in the spatial distribution and team composition of surrounding polling stations. Polling stations have an average of 1.2 immediate neighbors (ranging between 0 and 8), 0.39 being mixed team (ranging between 0 and 4). Neither of these characteristics differ significantly across team types, nor do the average numbers of non-neighbor total or mixed team polling stations within 0.25 kilometers, between 0.25 and 0.75 kilometers, or within the same or neighboring villages. As an additional test of the randomization validity, Appendix Table A1 shows that the assignment of a Muslim/Yadav officer to a given position is not significantly correlated with officer type in the other positions within that team.

In Panels D and E, I test for balance in the random samples of surveyed potential

[23] Polling stations across Bihar increased in number by 5.9 percent between the 2010 and 2014 elections.

[24] Section 4.2.2 describes how locations are defined.

[25] Observation numbers change across the previous election outcomes because the coalitions fielded candidates in different numbers of constituencies in 2010.

voters and election officers. The sample of potential voters is approximately 43 percent Muslim/Yadav, 39 percent literate, and 43 percent female. While respondents from mixed team polling stations are more likely to be female (approximately 45 versus 41 percent), none of the other characteristics differ significantly by team type, and I control directly for gender when relevant as described in the analysis that follows. Election officers are roughly 43 years old on average, and the majority are college educated (68%) and have prior polling station experience (66%).[26] No significant differences are observed in officer characteristics.[27]

4 Discrimination in election management

In Section 4.1, I provide experimental evidence of own-group bias in the decision making of local-level election officials. Section 4.2 exploits a natural policy experiment to identify the impacts of diversity in election officer teams on voting outcomes at the polling station level, and conducts a counterfactual analysis of effects on election outcomes. I use a combination of experimental and non-experimental individual-level evidence in Section 4.3 to examine impacts on the election day experiences of potential voters, and Section 4.4 concludes with a consideration of potential alternative explanations for the observed set of results.

4.1 Vignette experiment: officer own-group bias

I test for own-type bias in bureaucratic decision making using a vignette experiment embedded within the survey of election officers. Vignette experiments have been used previously to study questions in electoral settings (Carlson 2010, Banerjee et al. 2014) and are methodologically similar to the randomized correspondence studies in the labor market discrimination literature (Bertrand and Mullainathan 2004, Banerjee et al. 2009). I examine whether, holding all other information constant, a potential voter is more likely to be assessed by an election officer as qualified to vote if the two are of the same type.

Each respondent was read a vignette describing a hypothetical individual attempting to

[26] Election officers are officially required to be male, with rare exceptions in heavily Muslim areas, where female officers may be needed to interact with the female population. No sample stations are of this type.

[27] By definition, homogeneous officer teams do not contain Muslim/Yadav officers. Therefore balance tests across team types for officer characteristics are necessarily restricted to the sample of non-Muslim/Yadav officers. Section 4.4 considers potential differences in characteristics across officer types.

vote, with wording identical across respondents with the exception of the individual's name, which was randomly assigned. Respondents were then asked to indicate the likelihood on a 4-point scale, with 1 corresponding to "Very Unlikely" and 4 to "Very Likely", that the individual would be able to cast a vote. Each officer respondent was randomly assigned one of nine possible voter names. Three names each were chosen to signal Muslim, Yadav, or Brahmin (highest Hindu caste) identity in the hypothetical voter.[28]

To test whether an officer's evaluation of the likelihood of the potential voter's ability to cast a vote is influenced by whether that individual is of the same type as the officer, I use regression specifications of the form:

$$Y_{qpc} = \varphi_n + \pi_v + \theta Match_{qpc} + \mathbf{X'_{qpc}}\lambda + \epsilon_{qpc}. \tag{2}$$

Y_{qpc} is an outcome of officer q in polling station p in sub-constituency c. Additionally included are fixed effects for the randomly assigned potential voter name, φ_n, and election officer type, π_v. $Match_{qpc}$ is an indicator variable taking value 1 if the election officer's group type and that of the potential voter are the same (e.g. Yadav and Yadav) and 0 otherwise. The set of additional controls, $\mathbf{X}$, includes survey strata (sub constituency, team composition, and inferred officer type) fixed effects, polling-station-level characteristics (log number of registered voters, share Muslim/Yadav registered voters, number of neighboring polling stations, and fixed effects for team size and station building type), and officer-level characteristics (age, log monthly salary, and fixed effects for college completion, prior election officer experience, full-time occupation, and polling team position).

The potential-voter-name and officer-type fixed effects control for the average differences in assessed likelihood of the potential voter's ability to vote across the different hypothetical names and by officers of different types. Therefore the coefficient of interest, θ, gives the average change in officer assessment caused by the randomized officer-voter type match. I consider as outcomes both a continuous variable taking the 1-to-4 scale value and an indicator variable taking value 1 if the officer indicates the individual would be "Likely" or "Very Likely", as opposed to "Unlikely" or "Very Unlikely", allowed to vote.

Considering the 4-point-scale outcome variable, the left panel of Figure 2 shows a significant 0.24 point average increase in assessed voting ability likelihood when the potential

[28] Appendix B provides the full vignette text and the names in each potential voter category.

voter is of the same type as the election officer. Table 2 presents the underlying estimates from equation (2). To understand whether this shift reflects only movement from "Very Unlikely" to "Unlikely" or "Likely" to "Very Likely", as opposed to shifting across the unlikely to likely margin, I use the binary likelihood measure as an outcome. The right panel of Figure 2 shows a significant increase of 10 percentage points, or more than 25 percent, in the probability that an individual is assessed as at least likely able to cast a vote when of the same type as the election officer. Overall, the vignette experiment results provide evidence of own-group bias in the decision making of local-level election officials. In the following section, I examine whether team composition influences actual voting outcomes in a manner consistent with the presence of such bias among officers at polling stations.

4.2 Impacts on polling station voting outcomes

4.2.1 Within-station effects

Using the administrative vote returns data, Figure 3 plots the cumulative distribution and probability density functions of the polling-station-level vote share margin between the RJD and BJP, separately by team type. The results in the figure show that the average vote share of the RJD relative to that of the BJP is lower for teams with no minority officers, where the equality of the distributions can be rejected at the 5 percent level.

I further examine impacts on voting by estimating equation (1), with polling-station-level controls for the log number of registered voters and the Muslim/Yadav share of registered voters additionally included. Column (1) of Table 3 shows that the presence of a minority officer on a polling station team significantly shifts the vote share margin toward the RJD by 2.3 percentage points, or 12.7 percent. Underlying the vote share impact, in columns (2) and (3) I observe that, with mixed team composition, the votes received by the RJD increase by 4.6 percent and decrease by 4.1 percent for the BJP on average.

Consistent with the strong connections of religion and caste to political affiliation in this setting, I also observe that a 1 percentage point increase in the Muslim/Yadav share of registered voters at a polling station is associated with a 3 percent increase in RJD votes and 3 percent decrease in BJP votes. Changing from a homogeneous to mixed team of officers therefore has roughly the same impact as increasing the Muslim/Yadav share of registered voters by 1.5 percentage points, where the overall average share of Muslim/Yadav

registered voters across sample polling stations is 13 percent. Finally, while column (4) shows that the hypothesis of no average effect of mixed team composition on log total votes cast cannot be rejected, I am unable at 95 percent confidence to rule out effects of approximately 1.6 percentage points in magnitude in either direction, and, as described in Section 2.3, the expected impact of changing composition on total votes is ambiguous.[29]

4.2.2 Cross-station externalities

I next test for spatial externalities of team composition across polling stations. I exploit the fact that, for each polling station, the officer assignment mechanism also generates random variation in the proportion of neighboring stations with mixed officer teams. Stations are defined as neighbors if their locations match in the administrative data.[30] Similar to the approaches of Miguel and Kremer (2004) and Callen and Long (2015), I estimate spatial externalities of team diversity with the specification:

$$Y_{pc} = \mu_c + \theta_o + \beta Mixed_{pc} + \gamma T_{pc} + \phi N_{pc} + \mathbf{X'_{pc}}\lambda + \epsilon_{pc}, \tag{3}$$

where N_{pc} is the number of neighbors of polling station p in constituency c, and T_{pc} is the number of these neighbors with a mixed officer team. Impacts associated with polling station density are captured by N_{pc}, and, conditional on this density, the number of neighbors with mixed composition teams is randomly determined. The set of polling-station-level controls is the same as in the previous section, and standard errors are clustered at the location level.

The within-station direct effect of mixed team composition on voting outcomes is given by β, while γ is the average cross-station spillover effect of a mixed team neighbor. Also, since the team type at each polling station with a given number of neighbors is orthogonal to the number of those neighbors that are mixed team, the estimates of the within-station impacts of changes in team composition should be unchanged from equation (1).

I then extend the consideration of spatial spilloverrs to longer distances using two

[29] Appendix Table A2 tests for variation in impacts by the position within a team in which Muslim/Yadav officer presence occurs, and the presence of single versus multiple Muslim/Yadav officers. In neither case are significant differences observed.

[30] For example, a set of polling stations may be listed in the administrative data as located in "K L Primary School (South Part)", "K L Primary School (North Part)", and "K L Primary School (Middle Part)", respectively, and would be categorized as neighbors.

different approaches. First, I supplement equation (3) with the variables $N_{pc}^{0.25km}$ and $N_{pc}^{0.25-0.75km}$, the number of non-neighbor polling stations within 0.25km and between 0.25-0.75km of polling station p, and $T_{pc}^{0.25km}$and $T_{pc}^{0.25-0.75km}$, the numbers of such polling stations with mixed composition teams.[31] Second, while this specification allows the impact of team composition on other stations to vary with linear distance, it may also be that a more meaningful distinction is captured by administrative boundaries. I therefore employ a specification which augments equation (3) with variables for the total and mixed team numbers of non-neighbor polling stations within the same village as polling station p, N_{pc}^{vill} and T_{pc}^{vill}, and neighboring villages, N_{pc}^{nei} and T_{pc}^{nei}.[32]

The estimates of equation (3) in Table 4 identify the existence of chilling effects across polling stations in close proximity—minority officer presence at a given polling station influences voting outcomes at neighboring stations in the same direction as the within-station impacts. I observe in column (1) that a change in a neighboring polling station from homogeneous to mixed team composition causes a significant 2.6 percentage point average cross-polling-station shift in vote share toward the RJD away from the BJP. Columns (2) and (3) show an imprecisely estimated 3.1 percent increase in RJD votes and a significant 4.2 percent decrease in BJP votes across polling stations. Also, as expected under a properly conducted randomization, the point estimates for the within-polling-station mixed team indicator are unchanged as compared to those from equation (1).

The results of tests for spillover effects over greater distances, defined in linear distance and village boundaries, are presented in Panels A and B of Appendix Table A3. While both the within-station and cross-neighbor effects of team composition remain significant in these specifications, the estimates show no evidence of chilling or displacement effects over longer ranges.

In line with the experimental evidence of spillover effects of team diversity over short distances, the survey of randomly sampled polling station officers shows that teams in close proximity do not typically operate in isolation. Among officials at stations with at least one neighboring station in the same location, 65 percent of officials indicate that their team coordinated with the other team(s) on management of the shared location, and 53 percent

[31]The sample for this specification is slightly reduced, as it excludes polling stations which could not be matched to the 2010 polling station GPS coordinates.

[32]The top 1 percent of the village distribution in terms of polling stations has a mean of 98.8 as compared to the overall mean of 2.4, so the sample for this specification is trimmed to exclude polling stations located in or neighboring these villages, which are also urban and large in area relative to typical villages.

report interacting with officers on the other team(s) during election day proceedings.

4.2.3 Heterogeneity in effects by voter identity card coverage

If mixed team composition makes the administration of the voter identification process more neutral and the possession of voter identity cards by citizens reduces the scope of potentially discriminatory discretion available to officers, a substitute relationship between the two would be expected in terms of impacts on polling-station-level voting outcomes. I test for this substitutability using specifications of the form:

$$Y_{pc} = \mu_c + \theta_o + \beta Mixed_{pc} + \eta(Mixed_{pc} * ID_c) + \mathbf{X'_{pc}}\lambda + \epsilon_{pc}, \tag{4}$$

where ID_c is the proportion of registered voters in sub-constituency c with a voter identity card.[33] The top one percent of observations in terms of the absolute value of the vote share margin between the RJD and BJP are excluded from the sample.[34] Polling-station-level controls included are the log number of registered voters and the Muslim/Yadav share of registered voters, as before.

The main effect for ID_c is absorbed by the sub-constituency-level fixed effects, and the coefficient of interest is η, where an estimated sign opposite that of β indicates that polling station composition and voter identity card coverage exhibit substitutability in their impacts on voting outcomes. Sub-constituency-level voter identity card coverage is not randomly determined, and so could be correlated with other characteristics that mediate the impact of team composition on voting outcomes. As a robustness check, I therefore estimate a specification where I additionally interact officer team composition with sub-constituency-level measures of a set of such potential characteristics for which administrative data is available: the population proportions that are literate, Scheduled Caste/Scheduled Tribe, and Muslim/Yadav. Section 5.3.2 presents additional, individual-level evidence on the relevance of voter identity card possession to the impacts of officer team diversity on voting.

Columns (1) and (2) of of Table 5 show that the vote share margin shift toward the minority-aligned RJD caused by changing from a homogeneous team of officers to a mixed team is approximately 0.5 percentage points smaller per 1 percentage point increase in

[33] Sub-constituency is the lowest level for which administrative data on card coverage is available.
[34] These are polling stations where one coalition won by a margin of at least 88 percent.

voter identity card coverage. Underlying these effects, in columns (3) and (4) I observe that the positive impact of mixed team composition on RJD votes decreases by a significant 0.9 percentage points per 1 percentage point increase in voter identity card possession. The results for BJP votes in columns (5) and (6) also indicate that the team composition effects are strongest in areas with low voter identity coverage.

Voter identity card coverage in the sample sub-constituencies ranges from 76.3 to 93.9 percent.[35] Figure 4 plots the implied effects of mixed team composition over a similar range of coverage and demonstrates that the significant impact observed at lower card coverage levels becomes insignificant as full coverage is approached. Appendix Table A4 shows that the cross-station externalities of team composition on the vote share margin between the RJD and the BJP are significantly decreasing in identity card coverage as well.

4.2.4 Can team composition influence who wins elections?

Having identified significant impacts of religous/caste diversity in officer teams on voting outcomes within and across polling stations, I next examine whether these effects in aggregate can influence who ultimately wins elections. I conduct counterfactual calculations of the effects of alternative officer assignment mechanisms on the identities of winners in the 2014 parliamentary and 2010 and 2015 state assembly elections in Bihar.

I first use administrative data available across the state of Bihar to calculate the sub-constituency-level average numbers of neighbors for polling stations. Second, the observed margins of victory in each set of elections already reflect the effects of the underlying proportions of mixed team polling stations in each area. Finally, I assume that the proportion of mixed team polling stations in each sub-constituency is the same as the average value (0.324) across the two districts for which it can be directly observed in my data. Taking the coefficients from a version of equation (3) that allows for heterogeneity in impacts by voter identity card coverage, estimated on the sample districts for which I possess officer assignment information, I can then calculate the magnitudes of the shift in the proportion of mixed team polling stations required to change the outcome of each election in which the RJD and BJP coalitions fielded the top two candidates.[36]

I use these magnitudes to consider the effects of two alternatives to the current method

[35] The coverage rate ranges state-wide between 76.3 and 95.6 percent.

[36] Appendix B provides additional details.

of randomized officer assignment: (1) requiring mixed team composition in all polling officer teams, and (2) excluding Muslim/Yadav officers from teams. During the 2014 elections, the RJD and BJP fielded the top two candidates in 29 of the 40 parliamentary constituencies in Bihar (Appendix Figure A4 provides the distribution of vote share margins). As shown in Table 6, a shift to Alternative 1 is estimated to switch 1 election outcome in favor of the RJD and a shift to Alternative 2 to change 1 outcome to a BJP victory.

I repeat this exercise for the most recent prior state assembly elections in 2010 and the following assembly elections in 2015, where of 243 total contests the RJD and BJP fielded the top two candidates for 185 races in 2010 and for 206 races in 2015. Reflecting the greater number of close contests, in 2010 (2015), 33 (9) races are estimated to change to an RJD victory under Alternative 1 and 6 (5) elections to switch in favor of the BJP under Alternative 2.

In addition, the religious composition of candidates put forward and winning in elections differs considerably across the coalitions: 17.5 percent of RJD coalition candidates in the 2014 Bihar elections were Muslim, as compared to just 2.5 percent for the BJP coalition. Accounting for candidates' religious identities, the previous counterfactual calculations also indicate that a shift to all mixed team polling stations in Bihar would have led to an average 18.5 percent increase in Muslim legislators across the 2010, 2014, and 2015 elections. Recent work has shown that increasing Muslim representation in state legislatures in India results in significant reductions in child mortality rates and gains in educational attainment across both Muslim and non-Muslim households (Bhalotra et al. 2014), demonstrating how the impacts on election outcomes associated with officer team composition can have important downstream effects on outcomes directly relevant to citizen well-being.

4.3 Election day experiences of potential voters

4.3.1 List randomization experiment: biased officer behavior

I next consider whether potential voters viewed biased behavior by government polling station officials as a relevant election day phenomenon. As direct elicitation of survey respondents may yield unreliable estimates of the occurrence of potentially sensitive topics such as discrimination by state personnel during elections, I included list randomization experiments in the survey of potential voters. This method of indirect elicitation has

been used in a number of recent papers to generate measures of sensitive topics related to economic activity (Karlan and Zinman 2012) and political and electoral behavior (Gonzalo-Ocantos 2010, Kramon and Weghorst 2012, Burzstyn et al. 2016).

Two list randomization experiments were conducted, where a surveyed individual randomly assigned to the control group in one experiment was assigned to the treatment group in the second, and vice versa. Members of each group were asked to indicate, from a list of statements read to them, only the total number of statements that occurred at their polling station during the 2014 elections. Control respondents were given a list of four statements on non-sensitive election day topics, while treatment respondents were read the same list but with an additional sensitive statement included. The sensitive statements in the two list randomization experiments were: "One or more of the election officers at your polling station treated you or others differently based on your religion or caste" and "One or more of the election officers at your polling station tried to influence how you or others voted or to make it more difficult for you or them to cast votes".[37]

This approach prevents individual-level determination of which statements were chosen, but allows for the population-level prevalence of the sensitive statement's occurrence to be estimated as follows:

$$N_{ipc} = \phi Treat_{ipc} + \mathbf{X'_{ipc}}\lambda + \epsilon_{ipc}. \tag{5}$$

N_{ipc} is the number of statements indicated as occurring at polling station p by respondent i, and $Treat_{ipc}$ is an indicator variable for additionally receiving the sensitive statement. Assuming that respondents assess the sensitive item truthfully and the inclusion of the sensitive topic does not influence their evaluation of the non-sensitive items, ϕ gives an unbiased estimate of the population proportion for whom the sensitive item occurred.

Also included are controls for the survey strata (sub-constituency, above district-level Muslim/Yadav median registered voter share, at least 30 Muslim/Yadavs on electoral roll, team composition, inferred type), the same set of polling station characteristics as in the election officer regressions, individual-level characteristics (age, literacy, gender, Muslim/Yadav identity), and surveyor and survey location fixed effects. In addition, to proxy for household wealth,[38] the controls additionally include fixed effects for house construction type, livestock ownership, and electricity, running water, and toilet availability. Standard

[37] Appendix B provides the introductory prompt and non-sensitive statements used in these experiments.

[38] 19 percent of respondents replied "Don't know/No answer" to a monthly household income question.

errors are clustered at the polling station level.

Table 7 presents the results of the list randomization experiments, where columns (1) and (2) show the average number of statements chosen by the control and treatment groups, respectively. The estimates from equation (5) of the sensitive statement prevalences are given in column (3). They indicate that 23 percent of potential voter respondents agree that election officials at their polling stations treated voters differently based on religion or caste, and 13 percent that election officers tried to influence voting behavior at their polling stations.

Given that respondents may vary in their interpretations of the somewhat broad sensitive statements and list randomization has relatively low power because it is designed to provide aggregate- rather than individual-level measures (Bertrand and Duflo 2016), the aim of this set of experiments is to consider generally the occurrence of biased officer behavior connected to religion and caste on election day. The results suggest that polling station officers do attempt to influence voting behavior, and that religion and caste influence their treatment of voters. In the following section, I conduct tests to disentangle specifically how the impacts of team diversity vary with the identity of potential voters and the possession of voter identity cards.

4.3.2 Differences in election day experiences

In this section, I examine how the election day experiences of potential voters of different types vary with the composition of the officer team they interact with on election day and whether they possess a government-issued voter identity card. I estimate the following regression separately for individuals at mixed and homogeneous stations:

$$Y_{wpc} = \phi MY_{wpc} + \lambda ID_{wpc} + \psi \left(MY_{wpc} * ID_{wpc} \right) + \mathbf{X'_{wpc}}\lambda + \epsilon_{wpc}, \tag{6}$$

where Y_{wpc} is an outcome for respondent w at polling station p in sub-constituency c, and MY_{wpc} and ID_{wpc} are indicators for Muslim/Yadav identity and voter identity card possession. The same set of controls is used as with equation (5). To further account for any effects of differences in gender composition across the samples from mixed and homogeneous team polling stations, the vector of individual level controls also includes an interaction of gender with voter identity card possession. Standard errors are clustered at

the polling station level.

In Table 8, I first consider the likelihood of a potential voter having a satisfactory overall experience at the polling station on election day.[39] Column (1) shows that Muslim/Yadav potential voters facing homogeneous teams of officers are 6.2 percentage points less likely on average, as compared to non-minority voters, to rate their polling station experience as satisfactory. This difference is however absent among individuals who possess voter identity cards. Also, the value of λ shows that, for non-minority individuals, possession of a voter identity card does not significantly change the likelihood of having a satisfactory experience at the polling station.

Turning to mixed team polling stations, I find in column (2) that minority potential voters do not express lower overall satisfaction on average, nor does this change with voter identity card possession. Additionally, non-minority potential voters are not significantly less likely to express satisfaction with their polling station experience when facing a mixed as opposed to homogeneous team of officers.

A similar pattern of results is observed when considering potential voters' ability to cast a vote. Column (3) shows that, at polling stations with homogeneous officer teams, minority individuals are 10.2 percentage points less likely to be able to vote, but only if they are without a voter identity card. For non-minority potential voters, possession of a voter identity card does not impact the likelihood of being able to cast a vote. In contrast, column (4) shows that, at polling stations with minority officers present, voter identity card possession significantly increases the likelihood of being allowed to cast a vote by 12.8 percentage points, and that this effect does not vary with potential voter minority identity.

Finally, I consider in columns (5) and (6) potential effects on the environment at the polling station in terms of the absence of canvassing and disorderly behavior. I see no evidence of significant differences across potential voter categories for either team type, suggesting that stricter management of the area surrounding the polling station is not a primary channel through which the presence of minority officers on teams impacts polling station proceedings and voting outcomes.

Consistent with the previous experimental estimates, the results in Table 8 provide evidence that mixed team composition and voter identity card provision each reduce the dif-

[39]This variable takes value 1 if a respondent indicates that her overall voting experience at the polling station on election day was "Excellent","Good", or "Fair", as opposed to "Poor".

ferential treatment of potential voters at polling stations, where homogeneous non-minority officer teams are otherwise relatively more stringent toward minorities.

4.4 Alternative channels

Apart from influencing the likelihood that local-level officials exhibit biased behavior in their election duties, introducing religious/caste diversity into polling station teams could influence voting outcomes through a "team performance" channel. The literature on teams and heterogeneity has highlighted the potential tradeoff of benefits associated with a greater diversity of skills and information against increased communication and coordination costs and reduced motivation (Prat 2002, Hamilton et al 2003, Marx et al. 2015). However, effects of these types alone would not be expected to lead to impacts on votes received in opposite directions for each coalition, as observed previously. For example, changes in the overall productivity of the officer team could affect the length of waiting time and consequently the proportions of potential voters for each coalition willing to incur this cost of voting, with associated reductions in turnout.

It could also be that the identities of the election officials with whom potential voters interact at the polling station impact voting behavior through an "identity salience" channel. The behavior of voters has been shown to be sensitive to small changes (Gerber and Rogers 2009, Shue and Luttmer 2009, Bryan et al. 2011), and, even if officer actions are unaffected by team composition, the religion and caste of the election officials present on election day may be discerned by potential voters and influence their behavior.[40] Effects of this type among individuals already present at the polling station would be expected primarily to influence the choice of candidate, rather than the extensive voting margin. Given that I observe impacts on the ability of potential voters to cast votes, and that spillover effects of team composition are observed across polling stations, identity salience is unlikely solely to be driving the observed pattern of effects.

An additional possible concern in attributing the previously identified impacts to biased behavior associated with officers' religious and caste identities is that there may exist other characteristics that correlate with these identities and also influence voting outcomes. This is unlikely to explain the above results for two reasons: the previous analysis captures the effects of the presence on teams of officers that are either Muslim or Yadav, two groups that

[40]The official identification tags worn by polling station officers do not include their names, however.

are not particularly similar outside of their political alliance; and individuals of different religions and castes serving as polling station officers are more likely to be similar along other dimensions than would be their populations in general.

First, Yadavs are a lower-caste Hindu group in Bihar and, other than political orientation, it is unclear along what dimensions they would be systematically more similar to Muslims than to other Hindu groups, especially given the BJP's dispersed support across upper- and lower-castes in these elections. In Appendix Table A5, I examine the impacts on voting outcomes of Muslim and Yadav officer presence separately using a regression specification analogous to that of equation (1). The estimates reveal similar effects for Muslim and Yadav officers, where the shift in vote share margin toward the RJD is significant at the 5 percent level for both Muslim and Yadav presence on officer teams.

Second, polling station officers are selected from pools of government employees who are likely more similar than would be average individuals from different religious and caste groups. Table 9 tests in the sample of surveyed polling station officers for differences by Muslim/Yadav status across a number of characteristics plausibly proxying for experience and knowledge: age, log monthly salary, college graduation, and prior election officer experience. I regress each of these outcomes on an indicator variable for Muslim/Yadav identity and fixed effects for sub-constituency and team position. As a further check, I also construct measures of age and log monthly salary based on separate administrative data available for the full population of election officers in the district in which the officer survey was conducted. The results in columns (1) through (6) show that in no case is a significant difference by Muslim/Yadav status observed.

5 Conclusion

In this paper, I analyze survey-based experiments conducted with election personnel and voters in India, together with a natural policy experiment that generated random variation in the religious and caste composition of the teams of officers managing polling stations on election day. I provide evidence that local-level election officials exhibit own-group favoritism in their decision making, in a manner that undermines the impartiality of election administration. Voting outcomes within and across nearby polling stations change when minority officers are included in election officer teams, as minority individuals otherwise

experience a differentially stringent voter identity verification process as compared to their non-minority peers. In aggregate, these effects are large enough to influence election outcomes. To my knowledge, this is the first field-experimental evidence of how government personnel diversity impacts the provision of public services.

While this paper considers bureaucrat bias in the Indian electoral setting, questionable neutrality of election administration is a wideranging concern. Appendix Figure A5, based on the most recent round of the World Values Survey, shows that more than one quarter of respondents in nearly 75 percent of sample countries indicate that election officials are often unfair, and in more than half of countries that violence at polling stations is often a problem.[41] Though these proportions are on average higher in developing countries, election management issues may be relevant in higher income countries as well—a 2014 government study determined that "one of the signal weaknesses of the system of election administration in the United States is the absence of a dependable, well-trained corps of poll workers" (PCEA 2014), the population of which is disproportionately white (Hall and Moore 2014). The related literature on reforms to strengthen elections has focused in large part on the benefits of advances in monitoring and voting technology, and this paper makes a novel contribution in causally demonstrating the remaining importance of the identities of local-level election personnel. Indian elections are technologically advanced and their administration is highly regulated, indicating that bias in discretionary decisions of government personnel can undermine the quality of service provision even near the present frontier of election practice.

Though my findings show that diversity within teams of election officers can improve the impartiality of polling station management, mandating that such mixed composition occur may not always be politically or administratively feasible. My results, however, additionally demonstrate that policies which reduce the scope for discretion in officer duties in the first place may be promising alternatives in weakening the ability of local-level election officials to discriminate on election day and influence voting outcomes.

More generally, this paper provides well-identified evidence that equitable provision of public services may be weakened in ethnically heterogeneous environments when access involves discretionary decision making by local-level government personnel, whose underly-

[41] Round 6 (2010-2014) was the first to include election-related questions, which were asked of representative samples of individuals in 42 of the 60 surveyed countries.

ing biases may lead to discrimination against members of the public from different groups. These findings suggest that to improve performance in government work, in addition to attracting individuals that are of high quality and exhibit characteristics such as high intrinsic motivation (Finan et al. 2015), the design of state personnel policy may benefit from a focus on appealing to and screening for individuals who are less likely to discriminate against members of other groups. Understanding how better to do so presents an interesting avenue for future research.

References

[1] Abrams, David, Marianne Bertrand, and Sendhil Mullainathan (2012). "Do Judges Vary in Their Treatment of Race?" *Journal of Legal Studies* 41(2): 347-383.

[2] Acemoglu, Daron (2010). "Theory, General Equilibrium, and Political Economy in Development Economics." *Journal of Economic Perspectives* 24(3): 17-32.

[3] Acemoglu, Daron, Camilo García-Jimeno, and James A. Robinson (2015). "State Capacity and Economic Development: A Network Approach." *American Economic Review* 105(8): 2364-2409.

[4] Aker, Jenny, Paul Collier, and Pedro Vicente (2017). "Is Information Power? Using Mobile Phones and Free Newspapers during an Election in Mozambique." *Review of Economics and Statistics.* Forthcoming.

[5] Alesina, Alberto, Reza Baqir, and William Easterly (1999). "Public Goods and Ethnic Divisions." *Quarterly Journal of Economics* 114(4): 1234-84.

[6] Alesina, Alberto and Eliana La Ferrara (2005). "Ethnic Diversity and Economic Performance." *Journal of Economic Literature* 43(3): 762-800.

[7] Alesina, Alberto and Eliana La Ferrara (2014). "A Test of Racial Bias in Capital Sentencing." *American Economic Review* 104(11): 3397-3433.

[8] Anuja (2013). "Bihar poised to return to politics of caste, religion." *Mint*, August 5.

[9] Atkeson, Lonna Rae, Lisa A. Bryant, Thad E. Hall, Kyle L. Saunders and R. Michael Alvarez (2010). "A new barrier to participation: Heterogenous application of voter identification policies." *Electoral Studies* 29(1): 66-73.

[10] Banerjee, Abhijit and Rohini Somanathan (2007). "The political economy of public goods: Some evidence from India." *Journal of Development Economics*: 287-314.

[11] Banerjee, Abhijit, M. Bertrand, S. Datta, and S. Mullainathan (2009). "Labor Market Discrimination in Delhi: Evidence from a field experiment." *Journal of Comparative Economics* 37(1): 14-27.

[12] Banerjee, Abhijit, Donald Green, Jeffrey McManus, and Rohini Pande (2014). "Are Poor Voters Indifferent to Whether Elected Leaders are Criminal or Corrupt? A Vignette Experiment in Rural India." *Political Communications* 31(3): 391-407.

[13] Bertrand, Marianne, Robin Burgess, Arunish Chawla, and Guo Xu (2016). "The Costs of Bureaucratic Rigidity: Evidence from the Indian Administrative Service." Working paper.

[14] Bertrand, Marianne and Esther Duflo (2016). "Field Experiments on Discrimination." forthcoming in Abhijit Banerjee and Esther Duflo eds., *Handbook of Field Experiments*.

[15] Bertrand, Marianne and Sendhil Mullainathan (2004). "Are Emily and Greg More Employable Than Lakisha and Jamal? A Field Experiment on Labor Market Discrimination." *American Economic Review* 94(4): 991-1013.

[16] Besley, Timothy and Robin Burgess (2002). "The Political Economy of Government Responsiveness: Theory and Evidence from India." *Quarterly Journal of Economics* 117(4): 1415-1451.

[17] Besley, Timothy and Anne Case (1995). "Does Electoral Accountability Affect Economic Policy Choices? Evidence from Gubernatorial Term Limits." *Quarterly Journal of Economics* 110(3): 769-798.

[18] Besley, Timothy and Torsten Persson (2010). "State Capacity, Conflict, and Development." *Econometrica* 78(1): 1-34.

[19] Bhalotra, Sonia, Guilhem Cassan, Irma Clots-Figueras, and Lakshmi Iyer (2014). "Religion, Politician Identity, and Development Outcomes: Evidence from India." *Journal of Economic Behavior and Organization* 104: 4-17.

[20] Bryan, Christopher, Gregory Walton, Todd Rogers, and Carol Dweck (2011). "Motivating voter turnout by invoking the self." *Proceedings of the National Academy of Sciences* 108(31): 12653-12656.

[21] Burgess, Robin, Remi Jedwab, Edward Miguel, Ameet Morjaria, and Gerard Padró I Miquel (2015). "The Value of Democracy: Evidence from Road Building in Kenya." *American Economic Review* 105(6): 1817-1851.

[22] Burzstyn, Leonardo, Michael Callen, Bruno Ferman, Saad Gulzar, Ali Hasanain, and Noam Yuchtman (2016). "Identifying Ideology: Experimental Evidence on Anti-Americanism in Pakistan." Working paper.

[23] Callen, Michael J. and James D. Long (2015) "Institutional Corruption and Election Fraud: Evidence from a Field Experiment in Afghanistan." *American Economic Review* 105(1): 354-381.

[24] Carlson, Elizabeth (2010). "Great Expectations: Ethnicity, Performance, and Ugandan Voters." Working paper.

[25] Centre for Study of Developing Societies (CSDS) (2010) "Bihar Assembly Election Study 2010."

[26] Cobb, Rachael V., D. James Greiner and Kevin M. Quinn (2012). "Can Voter ID Laws Be Administered in a Race-Neutral Manner? Evidence from the City of Boston in 2008." *Quarterly Journal of Political Science* 7:1–33.

[27] Easterly, William and Ross Levine (1997). "Africa's Growth Tragedy: Policies and Ethnic Divisions." *Quarterly Journal of Economics* 112(4): 1203-1250.

[28] Ferraz, Claudio and Frederico Finan (2008). "Exposing Corrupt Politicians: The Effects of Brazil's Publicly Released Audits on Electoral Outcomes." *Quarterly Journal of Economics* 123(2): 703-745.

[29] Finan, Frederico, Benjamin A. Olken, and Rohini Pande (2015). "The Personnel Economics of the State." forthcoming in Abhijit Banerjee and Esther Duflo eds., *Handbook of Field Experiments*.

[30] Fujiwara, Thomas (2015). "Voting Technology, Political Responsivenss, and Infant Health: Evidence from Brazil." *Econometrica* 83(2): 423-464.

[31] Gerber, Alan S. and Todd Rogers (2009). "Descriptive Social Norms and Motivation to Vote: Everybody's Voting and So Should You." *Journal of Politics* 71(1): 178-191.

[32] Glaeser, Edward and Bruce Sacerdote (2003). "Sentencing in Homicide Cases and the Role of Vengeance." *Journal of Legal Studies* 32(2): 363-382.

[33] Gonzalo-Ocantos, Ezequiel, Chad Kiewiet de Jonge, Carlos Melendez, Javier Osorio, and David W. Nickerson (2012). "Vote Buying and Social Desirability Bias: Experimental Evidence from Nicaragua." *American Journal of Political Science* 56(1): 202-217.

[34] Habyarimana, James, Macartan Humphreys, Daniel Posner, Jeremy Weinstein (2007). "Why Does Ethnic Diversity Undermine Public Goods Provision?" *American Political Science Review* 101(4): 709-725.

[35] Hall, Thad and Moore, Kathleen (2014). "Poll Workers and Polling Places", in Alvarez, R. and Grofman, Bernard (eds.) *Election Administration in the United States: The State of Reform after Bush v. Gore*. Cambridge: Cambridge University Press, 175-185.

[36] Hamilton, Barton H., Jack A. Nickerson, and Hideo Owan (2003). "Team Incentives and Worker Heterogeneity: An Empirical Analysis of the Impact of Teams on Productivity and Participation." *Journal of Political Economy* 111(3): 465-497.

[37] Hjort, Jonas (2014). "Ethnic Divisions and Production in Firms." *Quarterly Journal of Economics* 129(4): 1899-1946.

[38] Hoogendoorn, Sander, Hessel Oosterbeek, and Mirjam Van Praag (2013). "The Impact of Gender Diversity on the Performance of Business Teams: Evidence from a Field Experiment." *Management Science* 59(7): 1514-1528.

[39] Ichino, Nahomi and Matthias Schündeln (2012). "Deterring or displacing electoral irregularities? Spillover effects of observers in a randomized field experiment in Ghana." *Journal of Politics* 74(1): 292-307.

[40] Jones, Bryan, Saadia Greenberg, Clifford Kaufman, and Joseph Drew (1977). "Bureaucratic Response to Citizen-Initiatied Contacts: Environmental Enforcement in Detroit." *American Political Science Review* 71(1): 148-165.

[41] Karlan, Dean and Jonathan Zinman (2012). "List Randomization for Sensitive Behavior: An Application for Measuring Use of Loan Proceeds." *Journal of Development Economics*, 98(1): 71-75.

[42] Kramon, Eric and Keith R. Weghorst (2012). "Measuring Sensitive Attitudes in Developing Countries: Lessons from Implementing the List Experiment." *The Experimental Political Scientist* 3(2): 14-24.

[43] Kumar, Sanjay (2014a). "BJP Crafts a New Social Coalition in Bihar." *Economic & Political Weekly* 49(39): 95-98.

[44] Kumar, Sanjay (2014b). "Bihar: interpreting the massive mandate." *The Hindu*, May 23.

[45] Lipsky, Michael (1980). *Street-Level Bureaucracy: Dilemmas of the Individual in Public Services*. New York: Russell Sage Foundation.

[46] Maskin, Eric and Jean Tirole (2004). "The Politician and the Judge: Accountability in Government." *The American Economic Review* 94(4): 1034-1054.

[47] Marx, Benjamin, Vincent Pons, and Tavneet Suri (2015). "Diversity and Team Performance in a Kenyan Organization." Working paper.

[48] McConnell, Brendon and Imran Rasul (2016). "Hispanic-White Sentencing Differentials in the Federal Criminal Justice System." Working paper.

[49] Miguel, Edward and Mary Kay Gugerty (2005). "Ethnic diversity, social sanctions, and public goods in Kenya." *Journal of Public Economics* 89(11-12): 2325-2368.

[50] Miguel, Edward and Michael Kremer (2004). "Worms: Identifying Impacts on Education and Health in the Presence of Treatment Externalities." *Econometrica* 72(1): 159-217.

[51] Muralidharan, Karthik, Paul Niehaus and, Sandip Sukhtankar (2016). "Building State Capacity: Evidence from Biometric Smartcards in India." *American Economic Review* 106(10): 2895-2929.

[52] Press Trust of India (2014). "Rs 30,000 crore to be spent on Lok Sabha polls: study."

[53] Prat, Andrea (2002). "Should a Team Be Homogeneous?" *European Economic Review* 46(7): 1187-1207.

[54] Presidential Commisson on Election Administration (PCEA) (2014). "The American Voting Experience: Report and Recommendations of the Presidential Commission on Election Administration." Washington, DC.

[55] Rasul, Imran and Daniel Rogger (2015). "Impact of Ethnic Diversity in Bureaucracies: Evidence from the Nigerian Civil Service." *American Economic Review: Papers and Proceedings* 105(5): 457-461.

[56] Rohde, David (2004). "On a Newfangled Voting Machine, the Same Old Fraud." *The New York Times*, April 27.

[57] Rukmini S. (2014). "The continuing grip of caste." *The Hindu*, March 16.

[58] Shayo, Moses and Asaf Zussman (2011). "Judicial Ingroup Bias in the Shadow of Terrorism." *Quarterly Journal of Economics* 126(3): 1447-1484.

[59] Shue, Kelly and Erzo F.P. Luttmer (2009). "Who Misvotes? The Effect of Differential Cognition Costs on Election Outcomes." *American Economic Journal: Economic Policy* 1(1): 229-257.

[60] Singh, K.S. (Ed.) (2008). *People of India: Vol. XVI. Bihar Including Jharkhand, Parts 1 and II*. Anthropological Survey of India.

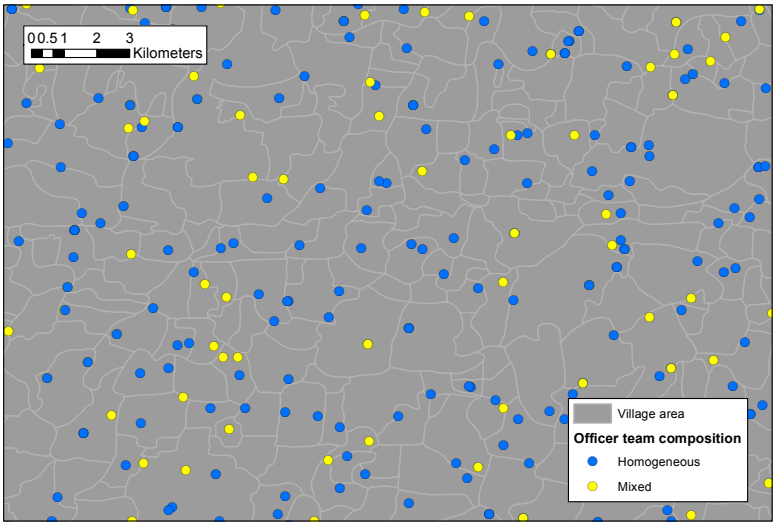
[61] Susewind, Raphael (2014). GIS shapefiles for India's parliamentary and assembly constituencies including polling booth localities. Bielefeld University. doi:10.4119/unibi/2674065.

[62] Svensson Jakob and David Yanagizawa-Drott (2012). "Estimating Impact in Partial vs. General Equilibrium: A Cautionary Tale from a Natural Experiment in Uganda." Working paper.

[63] White, Ariel, Noah Nathan, and Julie Faller (2015). "What Do I Need to Vote? Bureaucratic Discretion and Discrimination by Local Election Officials." *American Political Science Review* 109(1): 129-142

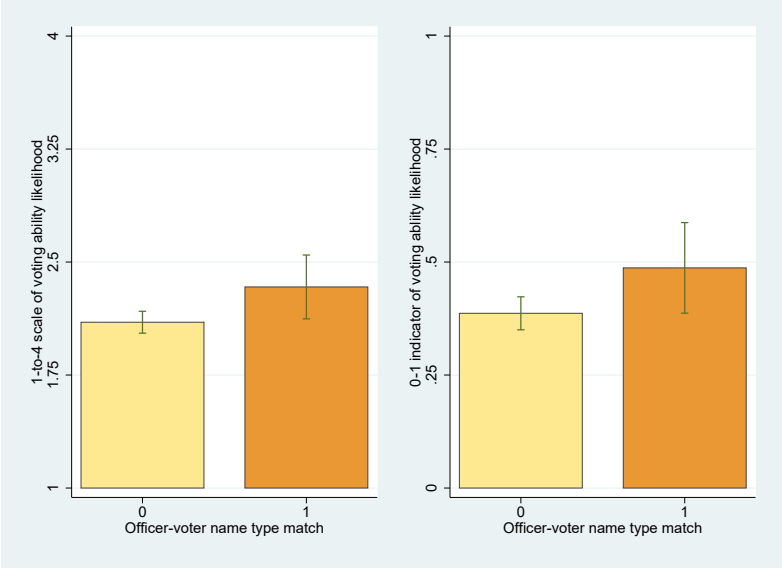
[64] Wittsoe, Jeffrey (2013). *Democracy Against Development: Lower-Caste Politics and Political Modernity in Postcolonial India.* Chicago: University of Chicago Press.

Figure 1: Example variation in officer team composition across polling stations



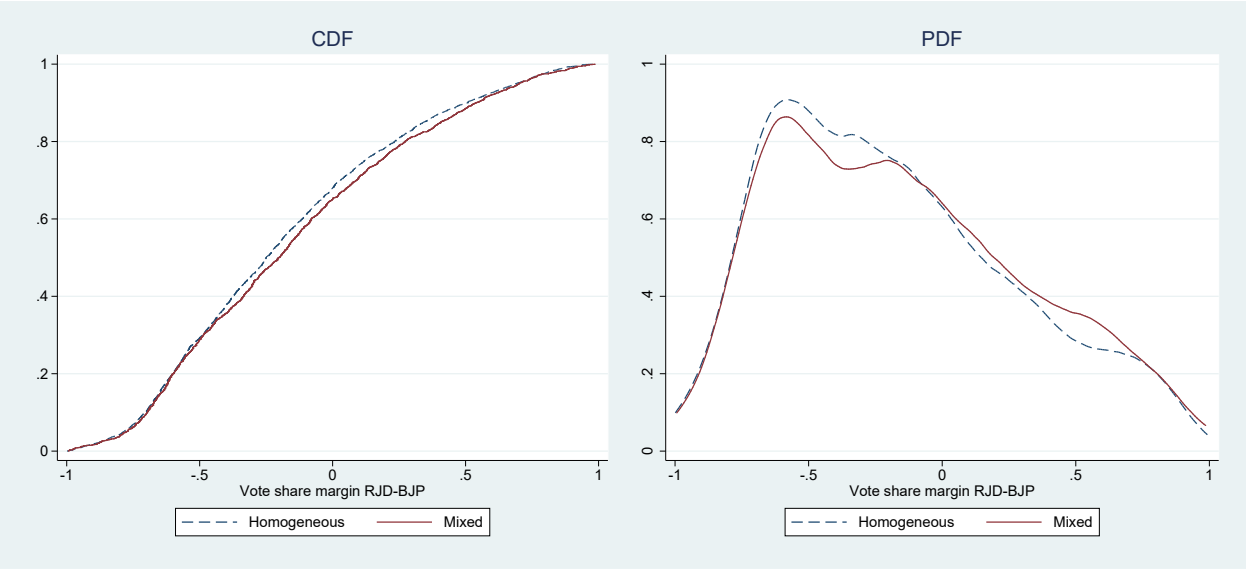
Notes: Each circle represents a polling station, with the color signifying whether the officer team is homogeneous or mixed in composition.

Figure 2: Own-type bias in officer assessment of voting qualification



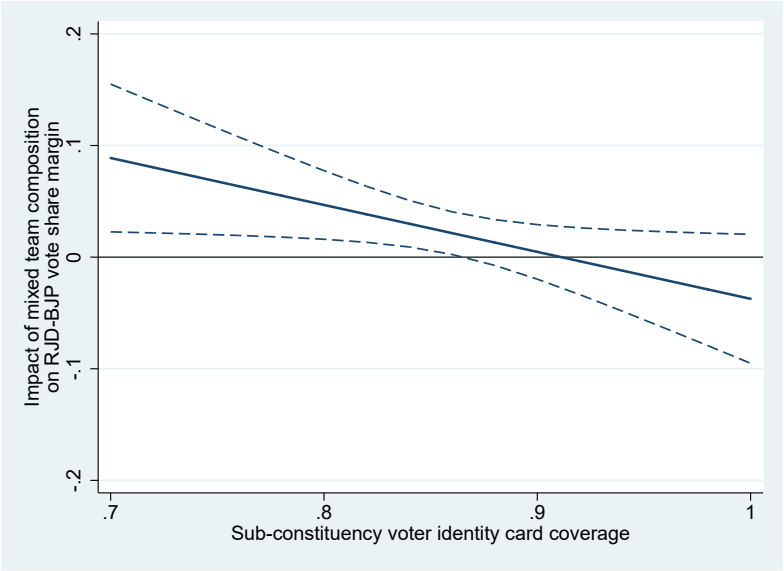
Notes: The left panel depicts the estimated 4-point-scale voting ability likelihood values given by officer respondents following the vignette. Estimates are based on the regression in column (1) of Table 2, assuming mean values of all control variables. The left bar represents the randomly assigned subset of officer respondents for whom the hypothetical individual's type (Muslim, Yadav, Brahmin) did not match the officer's own type, while the right bar represents the subset for whom the types matched. The right panel depicts the estimated probabilities of a respondent indicating that the hypothetical individual would be "(3) Likely" or "(4) Very Likely" able to cast a vote, as opposed to "(2) Unlikely" or "(1) Very Unlikely". Estimates are based on the regression in column (2) of Table 2, assuming mean values of all control variables. Error bars signify 95 percent confidence intervals.

Figure 3: Distribution of coalition vote share margins by team composition



Notes: The figure plots the empirical cumulative distribution and kernel density estimates of the polling station-level vote share margin between the RJD and BJP coalitions, separately for polling stations with homogeneous (dashed line) and mixed (solid line) teams of polling stations officers. Density estimated using an Epanechnikov kernel. The Kolmogorov-Smirnov equality-of-distributions test for the two groups of polling stations gives a p-value of 0.034.

Figure 4: Heterogeneity in team composition impact by voter identity card coverage



Notes: Figure plots the estimated polling-station-level impact of mixed team composition on the vote share margin between the RJD and BJP coalitions at different levels of sub-constituency-level voter identity card coverage. Dashed lines signify 95 percent confidence intervals. Calculated using the estimates from Column (1) of Table 5.

Table 1a: Balance tests

	Homog. team (1)	Mixed team (2)	Difference (3)	Obs. (5)
Panel A. Electorate characteristics				
Ln total registered voters	6.873	6.905	0.009	5,561
	[0.314]	[0.305]	(0.007)	
Share female registered voters	0.463	0.463	0.000	5,561
	[0.023]	[0.022]	(0.001)	
Share Muslim/Yadav registered voters	0.128	0.135	0.005	5,561
	[0.172]	[0.175]	(0.005)	
Panel B. Prior election characteristics				
Ln total votes	6.061	6.057	-0.007	5,275
	[0.332]	[0.319]	(0.009)	
Vote share margin RJD-BJP coalition	-0.287	-0.272	0.000	3,947
	[0.378]	[0.376]	(0.009)	
Ln votes RJD coalition	3.941	3.945	-0.009	5,246
	[1.424]	[1.403]	(0.023)	
Ln votes BJP coalition	4.940	4.901	-0.003	3,946
	[0.995]	[1.019]	(0.025)	
Panel C. Spatial characteristics				
Total neighbor stations	1.200	1.191	-0.027	5,561
	[1.614]	[1.647]	(0.034)	
Total stations within 0.25km	1.357	1.336	-0.025	5,097
	[2.930]	[2.904]	(0.073)	
Total stations within 0.25-0.75km	7.893	7.958	0.069	5,097
	[12.830]	[12.904]	(0.232)	
Total stations within village	3.686	3.812	0.088	3,231
	[5.551]	[5.868]	(0.212)	
Total stations in neighboring villages	14.259	14.479	0.065	3,216
	[10.694]	[10.544]	(0.369)	
Number mixed team neighbor stations	0.385	0.386	-0.012	5,561
	[0.746]	[0.719]	(0.018)	
Number mixed team stations	0.420	0.452	0.026	5,097
within 0.25km	[1.078]	[1.159]	(0.030)	
Number mixed team stations	2.536	2.622	0.066	5,097
within 0.25-0.75km	[4.263]	[4.470]	(0.084)	
Number mixed team stations	1.210	1.309	0.043	3,231
within village	[2.178]	[2.287]	(0.083)	
Number mixed team stations	4.688	4.829	-0.040	3,216
in neighboring villages	[3.908]	[4.015]	(0.136)	

Notes: Columns (1) and (2) report variable means with standard deviations in brackets for homogeneous and mixed officer teams. Column (3) reports the coefficient from an OLS regression of the listed outcome on an indicator for polling station mixed team composition. Also included are sub-constituency and number of officer fixed effects. Robust standard errors in parentheses. Prior election outcome values in Panel B are based on the average value across all polling stations from 2010 in the same location as the 2014 station. In Panel C, neighbor stations are those located within the same building/compound. Stations within 0.25 and within 0.25-0.75km are non-neighbors located within those distances of a given polling station. Panel C sample is restricted to stations matchable to the dataset of station GPS coordinates. Village-related outcomes further exclude stations in villages which are in the top 1 percent of the distribution in terms of number of polling stations contained within, or their neighboring villages. Significant at *10 percent, **5 percent,***1 percent.

Table 1b: Balance tests (cont.)

	Homog. team (1)	Mixed team (2)	Difference (3)	Obs. (4)
Panel D. Potential voter characteristics				
Muslim/Yadav	0.425	0.440	0.016	4,242
	[0.494]	[0.497]	(0.017)	
Age	45.60	45.48	-0.13	4,211
	[16.86]	[16.46]	(0.56)	
Literate	0.380	0.408	0.027	4,241
	[0.486]	[0.492]	(0.017)	
Female	0.411	0.458	0.047***	4,243
	[0.492]	[0.498]	(0.015)	
Household head	0.457	0.461	0.004	4,243
	[0.498]	[0.499]	(0.017)	
Ln monthly household income	8.279	8.313	0.034	3,411
	[0.789]	[0.795]	(0.033)	
Voter identity card possession	0.945	0.941	-0.004	4,240
	[0.229]	[0.235]	(0.008)	
Panel E. Officer characteristics				
Age	42.29	43.73	1.40	490
	[9.66]	[9.73]	(0.88)	
College graduate	0.687	0.656	-0.029	489
	[0.465]	[0.476]	(0.043)	
Ln monthly salary	9.556	9.608	0.053	477
	[0.617]	[0.567]	(0.054)	
First time officer	0.360	0.324	-0.038	484
	[0.481]	[0.469]	(0.043)	

Notes: Columns (1) and (2) report variable means with standard deviations in brackets for homogeneous and mixed officer teams. Column (3) reports the coefficient from an OLS regression where the listed outcome is regressed on an indicator for polling station mixed team composition and sub-constituency fixed effects. Robust standard errors in parentheses. Panel D considers potential-voter respondents. Panel E is restricted to non-Muslim/Yadav officer respondents, as by definition no Muslim/Yadav officers are present on homogeneous teams. Significant at *10 percent, **5 percent,***1 percent.

Table 2: Vignette experiment: own-group bias in assessment of voting qualification

	Ability to cast vote	
	4-point scale	0-1 indicator
	(1)	(2)
Officer/potential voter type match	0.236**	0.101*
	(0.118)	(0.056)
Observations	818	818
Non-match group outcome mean	2.109	0.391

Notes: Column (1) reports OLS estimates from an officer-level regression of a variable taking the 1-4 scale value ("Very unlikely (1)", "Unlikely (2)", "Likely (3)", "Very likely (4)") of the assessed likelihood of the hypothetical individual being allowed to vote on an indicator variable for whether the officer's own type matches that of the randomly assigned voter name (Muslim, Yadav, Brahmin). Column (2) reports OLS estimates from a regression with the outcome as an indicator variable taking value 1 if the respondent answers "Very likely" or "Likely" as opposed to "Unlikely" or "Very unlikely" and 0 otherwise. Also included are fixed effects for respondent name and officer type, and controls for survey strata (sub-constituency, team composition, and inferred officer type fixed effects), polling station characteristics (log registered voters, share Muslim/Yadav registered voters, number of neighbor polling stations, and fixed effects for team size and station building type), and individual-level characteristics (age, log monthly salary, and fixed effects for college completion, prior election officer experience, full-time occupation, and team position). Standard errors clustered at the polling station level in parentheses. Significant at *10 percent, **5 percent,***1 percent.

Table 3: Impacts of randomized officer team composition on voting outcomes

	Vote share margin RJD-BJP	Ln votes RJD	Ln votes BJP	Ln total votes
	(1)	(2)	(3)	(4)
Mixed team	0.023**	0.046*	-0.041*	0.001
	(0.010)	(0.027)	(0.021)	(0.008)
Muslim/Yadav registered voter %	0.015***	0.031***	-0.030***	-0.000
	(0.000)	(0.001)	(0.001)	(0.000)
Ln total registered voters	-0.060**	1.004***	1.178***	0.935***
	(0.023)	(0.060)	(0.048)	(0.018)
Observations	5,552	5,535	5,549	5,552
Homogeneous team outcome mean	-0.181	4.451	5.143	6.180

Notes: All columns report OLS estimates from polling-station-level regressions of the listed variable on an indicator for mixed team composition. Additionally included are sub-constituency and number of officer fixed effects and controls for Muslim/Yadav share of registered voters and log total registered voters. Robust standard errors in parentheses. Significant at *10 percent, **5 percent,***1 percent.

Table 4: Cross-station externalities of officer team composition

	Vote share margin RJD-BJP	Ln votes RJD	Ln votes BJP	Ln total votes
	(1)	(2)	(3)	(4)
Number mixed team neighbor stations	0.026***	0.031	-0.042**	0.003
	(0.010)	(0.027)	(0.019)	(0.008)
Mixed team	0.023**	0.045*	-0.040*	0.000
	(0.010)	(0.027)	(0.021)	(0.008)
Total neighbor stations	-0.032***	-0.045***	0.047***	-0.017***
	(0.005)	(0.015)	(0.010)	(0.005)
Observations	5,552	5,535	5,549	5,552
Number of locations	3,619	3,619	3,619	3,619

Notes: All columns report OLS estimates from regressions at the polling station level of the listed variable on an indicator for mixed team composition and variables for the numbers of total and mixed team composition neighboring polling stations. Neighbor stations are those located within the same building/compound. Additionally included are sub-constituency and number of officer fixed effects and controls for Muslim/Yadav share of registered voters and log total registered voters. Standard errors clustered at the location level in parentheses. Significant at *10 percent, **5 percent,***1 percent.

Table 5: Heterogeneity in effects of team composition by voter identity card coverage

	Vote share margin RJD-BJP		Ln votes RJD		Ln votes BJP	
	(1)	(2)	(3)	(4)	(5)	(6)
Mixed team *	-0.004**	-0.007**	-0.009*	-0.014*	0.005	0.010*
Voter identity card coverage %	(0.002)	(0.003)	(0.005)	(0.008)	(0.004)	(0.006)
Mixed team	0.383**	0.558*	0.809	1.072	-0.453	-0.960*
	(0.173)	(0.314)	(0.457)	(0.768)	(0.332)	(0.579)
Observations	5,442	5,442	5,429	5,429	5,439	5,439
Interacted sub-constituency controls		X		X		X

Notes: All columns report OLS estimates from regressions at the polling station level of the listed variable on an indicator for mixed team composition interacted with the sub-constituency-level percentage of registered voters with a voter ID card. Also included are sub-constituency and number of officer fixed effects and controls for Muslim/Yadav share of registered voters and log total registered voters. Even-numbered columns additionally include interactions (not shown) of team composition with sub-constituency-level measures of the population proportions that are literate and Schedule Caste/Schedule Tribe, and the share of registered voters that are Muslim/Yadav. Sample trims top one percent of observations in terms of absolute value of coalition vote share margin (stations with margin greater than 88 percentage points). Robust standard errors in parentheses. Significant at *10 percent, **5 percent,***1 percent.

Table 6: Changes in election outcomes under alternative assignment mechanisms

	State assembly 2010		Parliament 2014		State assembly 2015	
	BJP to RJD victory (1)	Vote share margin range (2)	BJP to RJD victory (3)	Vote share margin range (4)	BJP to RJD victory (5)	Vote share margin range (6)
All mixed teams	33	[-0.066, -0.0003]	1	-0.024	9	[-0.031, -0.003]
No mixed teams	-6	[0.004, 0.023]	-1	0.010	-5	[0.003, 0.010]

Notes: This table reports counterfactual estimates of the number of races for which the winning candidate would have switched between the RJD coalition and the BJP coalition under two alternative officer assignment scenarios: (1) the presence of all mixed composition teams; (2) the absence of any mixed composition officer teams. Columns (1), (3), and (5) give the number of races for which the winning party would change as indicated. Columns (2), (4), and (6) give the range of the RJD-BJP coalition vote share margins actually observed in the impacted constituencies. The calculations account for spillover effects from neighboring mixed team polling stations and heterogeneity in impact by sub-constituency level voter identity card coverage.

Table 7: List randomization: biased officer behavior on election day

	Control (1)	Treatment (2)	Difference (3)	Obs. (4)
Treated voters differently by religion/caste	2.045 [0.762]	2.289 [0.912]	0.230*** (0.022)	3,798
Attempted to influence voting	2.398 [0.681]	2.542 [0.808]	0.138*** (0.020)	3,815

Notes: Columns (1) and (2) report unconditional means, with standard deviations in brackets, of the control (individuals receiving a list of four non-sensitive statements with the listed statement omitted) and treatment (individuals receiving the same four statements plus the listed statement included) populations. Column (3) reports the coefficient from an OLS regression at the individual level of the total number of statements the respondent indicated occurred at the polling station during the 2014 elections on a treatment indicator. Additionally included are controls for survey strata (fixed effects for sub-constituency, above district-level Muslim/Yadav median registered voter share, at least 30 Muslim/Yadavs on electoral roll at polling station, inferred type), the same polling-station-level controls as in Table 2, surveyor and survey location fixed effects, and individual-level characteristics (age, literacy, gender, Muslim/Yadav identity, and fixed effects for house construction type, livestock ownership, and electricity, running water and toilet availability). Standard errors clustered at polling station level in parentheses. Significant at *10 percent, **5 percent,***1 percent.

Table 8: Election day experiences of potential voters

	Satisfactory overall experience		Able to cast vote		Orderly environment	
	Homog. team	Mixed team	Homog. team	Mixed team	Homog. team	Mixed team
	(1)	(2)	(3)	(4)	(5)	(6)
Possess voter identity card	-0.017	0.024	-0.001	0.128**	0.059	-0.009
	(0.011)	(0.033)	(0.024)	(0.055)	(0.045)	(0.033)
Muslim/Yadav	-0.062*	0.037	-0.102*	-0.013	-0.020	0.036
	(0.037)	(0.037)	(0.056)	(0.063)	(0.063)	(0.064)
Muslim/Yadav *	0.063*	-0.045	0.094*	0.002	0.015	-0.039
Possess voter identity card	(0.038)	(0.037)	(0.056)	(0.063)	(0.065)	(0.065)
Observations	2,078	2,034	2,111	2,084	2,092	2,070
Non-Muslim/Yadav without identity card outcome mean	1.000	0.943	0.961	0.857	0.907	0.891

Notes: All columns report OLS estimates from regressions at the individual level of the listed variable on an interaction of the Muslim-Yadav respondent indicator with an indicator for voter identity card possession, for the sample of polling stations indicated in each column. Additionally included are the same set of controls as in Table 7. "Satisfactory overall station experience" is an indicator for whether respondent indicated that their overall voting experience at the polling station on election day was "Excellent"/"Good"/"Fair", as opposed to "Poor". Standard errors clustered at polling station level in parentheses. Significant at *10 percent, **5 percent,***1 percent.

Table 9: Balance in characteristics by officer identity

	Survey data				Administrative data	
	Age	Ln monthly salary	College graduate	First time officer	Age	Ln monthly salary
	(1)	(2)	(3)	(4)	(5)	(6)
Muslim/Yadav officer	-0.37	-0.003	-0.011	-0.017	0.44	0.001
	(0.57)	(0.031)	(0.031)	(0.033)	(0.37)	(0.012)
Observations	859	838	850	853	5,983	6,198
Non-Muslim/Yadav outcome mean	43.05	9.583	0.671	0.341	44.98	9.291

Notes: All columns report OLS estimates from regressions at the officer level of the listed variable on an indicator for Muslim/Yadav identity. Additionally included are sub-constituency and officer-position fixed effects. Columns (1) through (4) are based on reported data from the survey of officers. Columns (5) and (6) are based on the full sample of administrative data available for the same district in which the surveys were conducted. Robust standard errors in parentheses. Significant at *10 percent, **5 percent,***1 percent.

For online publication

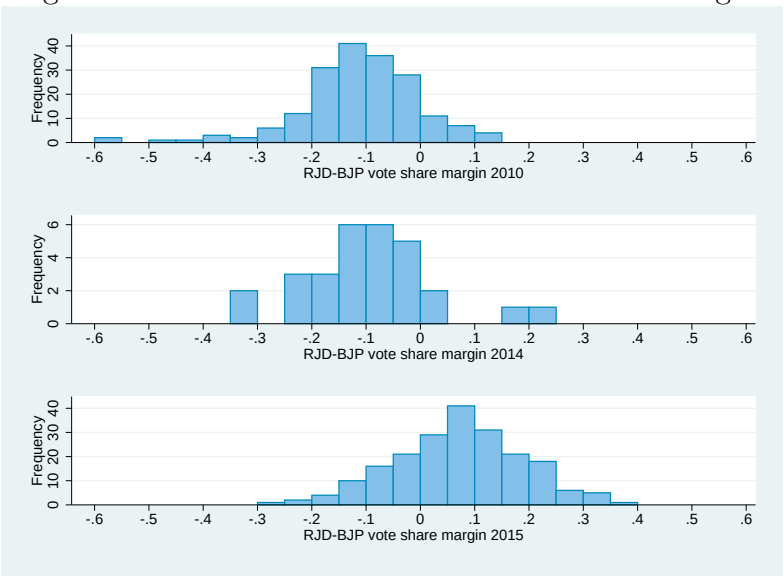
Appendix A: additional figures and tables

Figure A1: Example of polling officer team during election day proceedings

Figure A2: Example of government-issued voter identity card

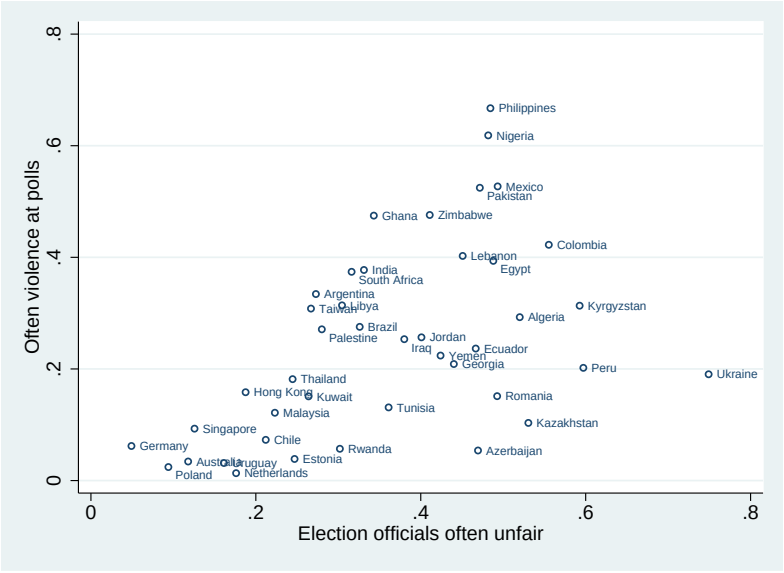
Figure A3: Example of neighboring polling stations in close proximity

Figure A4: Distribution of coalition vote share margins



Notes: Figure plots the distribution of the vote share margin between the RJD and BJP coalitions in Bihar, for the 185 of 243 races where these two coalitions fielded the top two candidates in the 2010 state assembly elections, the 29 of 40 races in the 2014 national parliamentary elections, and the 206 of 243 races in the 2015 state assembly elections.

Figure A5: World Values Survey: election administration problems



Notes: Measures computed using World Values Survey Wave 6 (2010-2014). "Election officials often unfair" is the weighted percentage of respondents in each country, when asked "In your view, how often do the following things occur in this country's elections?", answering "Not at all often" or "Not often" to "Election officials are fair", against the alternatives of "Very often", "Fairly often", or "Don't know/Not answer". "Often violence at polls" is the percentage answering "Very often" or "Fairly often" to "Voters are threatened with violence at the polls."

Table A1: Cross-position balance

	Presiding officer (1)	Polling officer 1 (2)	Polling officer 2 (3)	Polling officer 3 (4)	Polling officer 4 (5)
Muslim/Yadav presiding officer		-0.007	0.007	-0.005	-0.018
		(0.014)	(0.014)	(0.014)	(0.029)
Muslim/Yadav polling officer 1	-0.007		-0.001	-0.019	-0.015
	(0.012)		(0.013)	(0.013)	(0.027)
Muslim/Yadav polling officer 2	0.007	-0.001		0.013	-0.009
	(0.014)	(0.014)		(0.015)	(0.026)
Muslim/Yadav polling officer 3	-0.004	-0.019	0.012		-0.020
	(0.013)	(0.012)	(0.014)		(0.029)
Muslim/Yadav polling officer 4	-0.016	-0.014	-0.009	-0.017	
	(0.026)	(0.030)	(0.031)	(0.025)	
Observations	5,561	5,561	5,561	5,523	1,178

Notes: Each column reports coefficients from an OLS regression of the listed outcome (Muslim/Yadav assignment to the specified position) on dummies for Muslim/Yadav assignment to the other polling officer team positions specified in table. Additionally included are sub-constituency and number of officer fixed effects. Robust standard errors in parentheses. *Significant at *10 percent, **5 percent,***1 percent.

Table A2: Position- and number-specific impacts on voting outcomes

	Vote share margin RJD-BJP (1)	Ln votes RJD (2)	Ln votes BJP (3)	Ln total votes (4)
Panel A. Position				
Muslim/Yadav presiding officer	0.007	-0.006	-0.017	-0.012
	(0.020)	(0.052)	(0.043)	(0.018)
Muslim/Yadav polling officer 1	0.031*	0.088*	-0.013	0.017
	(0.019)	(0.050)	(0.037)	(0.011)
Muslim/Yadav polling officer 2	0.021	0.050	-0.064	0.002
	(0.020)	(0.052)	(0.044)	(0.014)
Muslim/Yadav polling officer 3	0.037*	0.054	-0.086**	0.000
	(0.019)	(0.050)	(0.040)	(0.019)
Muslim/Yadav polling officer 4	0.041	0.110	-0.001	0.001
	(0.087)	(0.189)	(0.170)	(0.033)
Observations	5,293	5,276	5,290	5,293
F-test p-value: equality of coeffs.	0.824	0.731	0.612	0.614
Panel B. Number				
Any Muslim/Yadav officer	0.027**	0.055*	-0.046**	0.002
	(0.011)	(0.028)	(0.022)	(0.008)
Multiple Muslim/Yadav officers	-0.024	-0.061	0.040	-0.010
	(0.024)	(0.061)	(0.053)	(0.018)
Observations	5,552	5,535	5,549	5,552

Notes: All columns in Panel A report OLS estimates from polling-station-level regressions of the listed variable on indicators for Muslim/Yadav presence in each polling party position, conditional on there being 1 or fewer total MY officers at the station. All columns in Panel B report OLS estimates from regressions at the polling station level of the listed variable on indicators for the degree of Muslim/Yadav presence. Additionally included in all regressions are sub-constituency and number of officer fixed effects and controls for the log number of registered voters at the polling station and the Muslim/Yadav share of registered voters. Robust standard errors in parentheses. *Significant at *10 percent, **5 percent,***1 percent.

Table A3: Cross-station externalities - extended range

	Vote share margin RJD-BJP	Ln votes RJD	Ln votes BJP	Ln total votes
	(3)	(1)	(2)	(4)
Panel A. Buffer radius				
Number mixed team neighbor stations	0.026***	0.024	-0.049**	-0.001
	(0.010)	(0.026)	(0.020)	(0.008)
Number mixed team stations within 0.25km	-0.006	0.012	0.013	-0.004
	(0.009)	(0.026)	(0.014)	(0.007)
Number mixed team stations within 0.25-0.75km	-0.003	-0.006	0.005	0.000
	(0.004)	(0.009)	(0.008)	(0.002)
Mixed team composition	0.033**	0.062**	-0.060***	-0.001
	(0.011)	(0.028)	(0.022)	(0.008)
Total neighbor stations	-0.021***	-0.028**	0.027***	-0.011***
	(0.005)	(0.013)	(0.010)	(0.003)
Total stations within 0.25km	-0.007**	-0.028**	0.007	-0.006**
	(0.003)	(0.011)	(0.006)	(0.003)
Total stations within 0.25-0.75km	-0.003*	0.001	0.007***	0.001
	(0.001)	(0.004)	(0.003)	(0.001)
Observations	5,090	5,074	5,087	5,090
Number locations	3,301	3,291	3,299	3,301
Panel B. Village boundaries				
Number mixed team neighbor stations	0.048**	0.069	-0.108***	0.011
	(0.020)	(0.054)	(0.041)	(0.011)
Number mixed team stations within village	0.010	-0.017	-0.044	-0.003
	(0.016)	(0.039)	(0.029)	(0.008)
Number mixed team stations in neighboring villages	0.009	0.008	-0.020*	0.004
	(0.006)	(0.013)	(0.011)	(0.003)
Mixed team composition	0.037**	0.083**	-0.070**	0.010
	(0.015)	(0.038)	(0.031)	(0.011)
Total neighbor stations	-0.044***	-0.033	0.102***	-0.001
	(0.012)	(0.033)	(0.026)	(0.010)
Total stations within village	-0.004	0.016	0.016	-0.000
	(0.007)	(0.019)	(0.013)	(0.003)
Total stations in neighboring villages	-0.004*	0.000	0.011**	0.000
	(0.002)	(0.005)	(0.004)	(0.001)
Observations	3,212	3,196	3,210	3,212
Number villages	1,246	1,243	1,246	1,246

Notes: Each column within a panel reports OLS estimates from a regression at the polling station level of the listed variable on an indicator for mixed team composition and variables for the numbers of total and mixed team composition polling stations within the various distances indicated. Each regression includes sub-constituency and number of officer fixed effects and controls for log total registered voters and share Muslim/Yadav registered voters. Neighbor stations are those within the same building/compound of a given polling station. Stations within 0.25 and 0.25-0.75km are non-neighbor stations within the stated distance of a given polling station. Numbers of stations within a village and in neighboring villages are the numbers of non-neighbor polling stations within the same village as a given station and in villages adjacent to a given station's village. Panel A is restricted to stations matched to the dataset of station GPS locations. Panel B further excludes stations in the top 1 percent of villages in terms of number of stations contained within, or their neighboring villages. Standard errors clustered at the location and village level in parentheses for Panel A and B, respectively. Significant at *10 percent, **5 percent,***1 percent.

Table A4: Cross-station externalities and heterogeneity by voter identity card coverage

	Vote share margin RJD-BJP	
	(1)	(2)
Mixed team *	-0.004**	-0.006*
Voter identity card coverage %	(0.002)	(0.003)
Number mixed team neighbor stations *	-0.003	-0.005*
Voter identity card coverage %	(0.002)	(0.003)
Mixed team	0.372**	0.503
	(0.173)	(0.313)
Number mixed team neighbor stations	0.264	0.473*
	(0.177)	(0.257)
Observations	5,442	5,442
Interacted sub-constituency controls		X

Notes: All columns report OLS estimates from regressions at the polling station level of the listed variable on an indicator for mixed team composition and variables for the numbers of mixed team and total (not shown) neighboring polling stations, and their interactions with the sub-constituency-level percentage of registered voters with a voter ID card. Also included are sub-constituency and team size fixed effects and controls for Muslim/Yadav share of registered voters and log total registered voters. Column (2) also includes interactions (not shown) with sub-constituency-level measures of the population proportions literate and Scheduled Caste/Scheduled Tribe, and the share of Muslim/Yadav registered voters. Sample trims top one percent of observations in terms of absolute value of coalition vote share margin. Standard errors clustered at the location level in parentheses. Significant at *10 percent, **5 percent,***1 percent.

Table A5: Type-specific impacts of officer identity on voting outcomes

	Vote share margin RJD-BJP	Ln votes RJD	Ln votes BJP	Ln total votes
	(1)	(2)	(3)	(4)
Any Muslim officer	0.023**	0.051*	-0.034	0.011
	(0.012)	(0.030)	(0.024)	(0.008)
Any Yadav officer	0.044**	0.070	-0.100**	-0.033
	(0.022)	(0.057)	(0.044)	(0.025)
Muslim/Yadav registered voter %	0.015***	0.031***	-0.030***	-0.000**
	(0.000)	(0.001)	(0.001)	(0.000)
Ln total electors	-0.069***	1.007***	1.198***	0.934***
	(0.024)	(0.062)	(0.050)	(0.019)
Observations	5,293	5,276	5,290	5,293
F-test p-value: equality of coeffs.	0.359	0.750	0.166	0.083

Notes: All columns report OLS estimates from regressions at the polling station level of the listed variable on indicators for Muslim and Yadav presence, conditional on there being 1 or fewer total Muslim/Yadav officers at the polling station. Additionally included are sub-constituency and number of officer fixed effects and controls for Muslim/Yadav share of registered voters and log total registered voters. Robust standard errors in parentheses. Significant at *10 percent, **5 percent,***1 percent.

Appendix B: Data collection and experimental details

Vignette experiment

Experiment prompt

"Please consider the following situation: A voter named [RANDOMLY ASSIGNED] arrives at the polling station without an EPIC card but has a government voter's slip without a photograph. He can recite his name and other particulars. On a scale of 1 to 4, how likely do you think it is that he would be allowed to cast a vote based on this information?", where the potential responses are "Very unlikely (1)", "Unlikely (2)", "Likely (3)", "Very likely (4)".

Randomly assigned names

- Muslim: Najam Uddin, Mustak Ansari, Mohammed Alam
- Yadav: Ajay Yadav, Kailesh Yadav, Surendra Yadav
- Brahmin: Arjun Tripathi, Rohit Mishra, Alok Chaturvedi

List randomization experiments

Experiment prompt

"I'm going to read you a list of various statements, and I would like for you to tell me how many of them occurred during the previous 2014 Lok Sabha election. Please, count to yourself. Do not tell me which ones, only HOW MANY IN TOTAL. For example, it might be that none of them occurred, all of them occurred, or any number in between."

Non-sensitive statements

Experiment 1

- Your polling station was located in a government school building.
- There were other polling stations at the same building/location as your polling station.
- You saw campaign posters in your neighborhood before the election.
- One or more of the election officers at your polling station was female.

Experiment 2

- You heard political party advertisements on television or radio before the election.
- You stood in line while waiting to vote at your polling station.
- A police/security officer was at your polling station while you were there.
- One or more of the election officers at your polling station was from your village.

Survey sampling

Potential voters survey

Polling stations in urban areas, where locating specific individuals based on the information available in the electoral roll would not have been feasible, were excluded from the sample (8.3 percent of total). Also excluded were polling stations with only three election officers (0.7 percent of total), as were polling stations that were split across a main polling station and an extension station (9.8 percent of total). The publicly avialable lists of registered voters were at the (main+extension) level, so it was not possible to determine to which of the main station or extension individuals were assigned. The only difference between having a main and extension station versus two polling stations in the same location is whether the threshold for maximum registered voters at a single station was reached after the formal yearly deadline to split polling stations. Administration is otherwise identical.

In some locations, fewer than three Muslims or two Yadavs were identified in the list. If too few Muslims were available, Yadavs were randomly drawn to fill the positions when possible, and vice versa. If fewer than five Muslims and Yadavs in total were identified, individuals that were neither Muslim nor Yadav were randomly drawn to fill the position.

Seasonal migration is common in the survey area and the electoral rolls contain errors (e.g. listed individuals may be duplicates or have moved and registered at another polling station without being deleted from the list at the previous station). Therefore, randomly drawn backup respondents were also identified for each primary respondent. In addition, if a located individual indicated that they did not go to the polling station to attempt to vote on election day, the next backup individual was then substituted. In the final sample, 36.6 percent of respondents were from the primary sample, 22.6 percent were the first backup, 14.6 percent were the second backup, 11.2 percent were the third backup, and 15 percent were fourth backup or higher. These rates of replacement are similar to those of other surveys in the region which identified respondents based on the electoral roll (Banerjee et al. 2014). The proportion of primary versus backup respondents does not differ significantly by whether the polling station is mixed versus homogeneous team.

Election officers survey

A total of 6,251 officers served at polling stations during the 2014 election in the district in which the survey was conducted. Out of these officers, 6,045 had phone numbers listed in the administrative data which were not obviously incorrect (i.e. having the wrong number of digits or all zero numerals).

Of these 6,045 individuals, 614 officers were inferred as Muslim or Yadav. Each of these individuals was attempted to be reached by phone. One non-Muslim/Yadav officer was randomly selected for calling from each of the mixed composition teams of which the previous 614 Muslim/Yadav officers were a member. If the officer could not be reached or did not consent, another officer of the same type was selected as a replacement, if possible. An additional 600 homogeneous polling teams were randomly chosen, stratifying by sub-constituency, and an officer from within the team was randomly selected. Again,

if the officer could not be reached or did not consent, another officer was selected as a replacement, if possible. A total of 2,340 officers were called. In 30 percent of instances the individual was not reachable (in large part due to the listed phone number no longer being functional/up-to-date), and initial non-consent was low (1.4%). From the population of mixed team polling stations with an M-Y officer and non-MY officer each confirmed as initially consenting and homogeneous polling stations with an officer confirmed as initially consenting, 305 mixed team and homogeneous polling stations each were randomly selected as described in the main text.

Counterfactual calculation details

The total estimated effect on the RJD-BJP coalition vote share margin of shifting to a mixed composition polling station team is the sum of the within-station effect and the cross-station spillover effect multiplied by the number of neighbor polling stations, adjusting for the sub-constituency level of voter identity card coverage, ID_c. Sub-constituency-level administrative data available for the 2010 and 2014 election cycles across the entire state of Bihar allows me to observe the voter identity card coverage and calculate the average number of polling station neighbors in each sub-constituency, N_c. This data is not yet available for the 2015 elections, so the 2014 neighbor and identity card coverage values are used for that election cycle.

Taking the coefficients from a modified version of equation (3) allowing for heterogeneity by identity card coverage, estimated on the sample districts for which I possess officer assignment information,

$$\begin{aligned} Y_{pc} = \mu_c + \theta_o + \beta Mixed_{pc} + \gamma T_{pc} + \phi N_{pc} + \beta_2 \left[Mixed_{pc} * ID_c\right] \\ + \gamma_2 \left[T_{pc} * ID_c\right] + \phi_2 \left[N_{pc} * ID_c\right] + \mathbf{X'_{pc}}\lambda + \epsilon_{pc}, \end{aligned}$$

the impact of a change of magnitude, X, in the proportion of mixed polling stations in a sub-constituency can be estimated as $X * [(\beta + \gamma * N_c) + (\beta_2 + \gamma_2 * N_c) * ID_c]$. As the baseline shares of mixed teams outside my sample area are not observed, I assume the proportions are the same as that in the observable sample, 0.324. The value of X needed to change the outcome of the race between the RJD and BJP coalitions can then be calculated using the previous estimate together with the constituency level margins of victory. When calculating impacts at the parliamentary constituency level, I take a weighted average (based on number of polling stations) across the sub-constituencies within each parliamentary constituency.