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

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December 21, 2017

Abstract

This paper investigates the effects of polling station administrator diversity on elections in India, using a natural experiment—the random assignment of government officials to teams managing stations on election day—together with surveys conducted with voters and election officers. I demonstrate that changes in the religious and caste composition of officer teams impact voting at the polling station level, causing shifts in coalition vote shares large enough to influence election outcomes. Effects are strongest when officers have greater discretion over the voting process. I also provide evidence suggesting own-group favoritism by election personnel as one relevant mechanism.

JEL Codes: C93, D02, D72, D73, O17

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The provision of free and fair elections is 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). Questionable neutrality of election administration, however, remains a wide-ranging concern—in the most recent round of the World Values Survey, more than one quarter of respondents in nearly 75 percent of sample countries indicate that election officials are often unfair.[1] Though these proportions are on average higher in developing countries, election management issues may be relevant in higher income countries as well. A 2014 U.S. government study, for example, 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" (Persily et al. 2014, 45).

In this paper, I provide novel experimental evidence in the context of India—the world's largest democracy—that voting outcomes at polling stations are significantly impacted by the religious and caste composition of the bureaucrat teams who manage them on election day. In addition, these effects are large enough in magnitude to be relevant to election outcomes. While such impacts on voting could arise even in the absence of changes in election officer behavior, I present a variety of additional evidence which suggests they are driven at least in part by own-group bias in the decision making of election officials.

Convincingly estimating the impacts of election officer team composition on voting is typically challenging due to the potential for confounding selection in the placement of officials at polling stations. A government for instance may assign election personnel with greater experience to manage more troubled locations in an effort to maintain neutrality or, alternatively, the ruling party may station supporters as officers in strategically important areas to influence voting outcomes in their favor. Circumventing issues of this type, I take advantage of a natural 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

[1] Round 6 (2010-2014) was the first to include questions evaluating the election process, which were asked of representative samples of individuals in 42 of 60 surveyed countries. Online Appendix Figure A1 plots country-specific values.

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).[2]

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 that cover 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.[3]

The teams of officers in the study area contained at least one minority individual approximately one third of the time. 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.

Using unique administrative data on officer assignment from the natural experiment and precise polling station location information, I first 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 2.5 percentage points, or 13.8 percent, when the team at a given polling station includes at least one minority officer. This shift is driven by a significant 4.9 percent increase in votes for the minority-oriented coalition and a 4.2 percent decrease in votes for the opposing coalition.

[2]The randomized assignment of officers and polling station teams was employed statewide in Bihar beginning in 2004, and has since been adopted nationwide.

[3]Wittsoe (2013) provides a detailed account of the state of the alliance over time. Bihar is also generally considered among the states with the worst problems of political corruption over this time period.

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 2.7 percentage points, demonstrating that omission of cross-station spillovers would lead to an underestimate of the total impact of team composition. 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.

The estimated effects of team composition are large. Counterfactual calculations suggest that having at least one minority officer included in each polling station team would have changed the identity of the winning coalition in approximately 7 percent of races in recent national and state elections in Bihar. In addition, these changes in election outcomes would have led to roughly a 12 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).

To shed additional light on the mechanisms through which the composition of polling station officer teams influences voting, I collected survey data from more than 5,100 individuals randomly selected from the same populations of local-level election officers and potential voters that participated in the 2014 elections.[4] In the survey of election officers, I employed 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.

I then turn to individual-level evidence on the election day experiences of potential voters. My results suggest that approximately 23 percent of potential voter respondents perceive that officers on election day treated the public differently based on religion or caste, and 14 percent that officers attempted to influence voting behavior. I also find that non-minorities have significantly higher probabilities of being allowed to vote and expressing satisfaction

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

with their election day station experiences at polling stations with no minority officers, while no such effects are observed for minority individuals. These differences by officer team composition and potential voter religious/caste-type are absent, however, when individuals possess voter identity cards. Taken together my results clearly demonstrate that voting outcomes are influenced by the composition of officer teams managing polling stations on election day. They also suggest that own-group bias influences bureaucratic decision making in a manner which undermines the impartial provision of elections, but that its effects can be mitigated by reducing the scope for discretion in officer duties.

This paper contributes to a number of research areas. A small body of field experimental work investigates the impacts of ethnic diversity on the performance of organizations and teams, where the studies in this area have focused on productivity in private sector settings (Hoogendoorn and Van Praag 2012, Hjort 2014, Marx, Pons, and Suri 2016).[5] Another emerging literature uses field and natural experiments to improve our understanding of the personnel economics of the state in developing country settings (Finan, Olken, and Pande 2015, Bertrand et al. 2016). This study bridges these literatures by demonstrating experimentally in India that the religious/caste composition of teams of front-line public sector employees can impact the quality of services the state is able to deliver. My findings are also relevant to an established literature that has studied the negative impacts of societal ethnic fractionalization on the quality of government decisions and the provision of public goods (Easterly and Levine 1997, Alesina, Baqir, and Easterly 1999, Alesina and Ferrara 2005, Miguel and Gugerty 2005, Banerjee and Somanathan 2007, Habyarimana et al. 2007). I provide evidence on an additional area, the administration of elections, in which heterogeneity in the ethnic composition of a population can lead to adverse effects on public services.

In addition, while a sizeable literature examines the potential for differential treatment by race and ethnicity in the judicial system (Shayo and Zussman 2011, Abrams, Bertrand, and Mullainathan 2012, Alesina and La Ferrara 2014, McConnell and Rasul 2017), this paper extends consideration to the electoral process of the potential relevance of these dimensions

[5] 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.

to the decision making of government officials interacting directly with the public.[6] In doing so, it also relates to a body of work that studies the experiences of blacks and Hispanics in the American electoral system and finds 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, Greiner, and Quinn 2012, White, Nathan, and Faller 2015).[7]

The paper proceeds as follows. The next section describes the institutional background and the predicted effects of changes in officer team composition on voting. Section II describes the data and performs randomization checks. Section III presents the findings on the impacts of team composition on voting, and Section IV provides evidence on mechanisms. Section V concludes.

I Background

A 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), each containing roughly 250 polling stations on average and electing a representative to the state assembly during an election cycle distinct from that of national elections. 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 bureau-

[6]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. 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 from the latter in examining impacts of the identities of local-level state personnel, independent of those of elected officials.

[7]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 and Long 2015, Fujiwara 2015, Aker, Collier, and Vicente 2017), less progress has been made in understanding, holding the electoral setting otherwise constant, how state election personnel identities matter – though a body of work does examine the effects of non-government observers and explicitly partisan personnel on polling station proceedings (Hyde 2007, Ichino and Schündeln 2014, Sjoberg 2016, Casas et. al 2017).

cratic structure is divided into 38 districts. PC and district boundaries generally do not fully coincide, and 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.[8] Each polling team position has distinct administrative responsibilities and is staffed from a separate district-level pool of state government employees.[9] 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. The randomization is conducted in the presence of official observers assigned by the national office of the Election Commission of India (ECI). 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. The software also automatically generates team rosters with photographs. Section II.D 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.[10] To the extent that

[8]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 stations 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.

[9]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.

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

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 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). 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.

B 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 elections 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, 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.

C 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.[11] In combination with a number of other ECI initiatives,[12] 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.

C.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 could 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 processes; 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.[13]

[11] 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).

[12] 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.

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

Relative to a 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 the likelihood of such behavior. Officers within a team are stationed in close proximity, typically sitting directly adjacent to one another (see Online Appendix Figure A2). 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. Alternatively, despite their proximity to one another, officers may carry out their duties in more of a siloed fashion, and a greater diversity of officer types could increase the number of potential voter types who experience positive or negative bias during polling station proceedings.

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—official guidelines on polling station management even state that minor errors in the EPIC (government-issued voter identity card) and electoral roll can be ignored (Election Commission of India 2014)—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. The identity verification step then may be particularly susceptible to biased officer behavior that potentially results in changes in voters' candidate choice, 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 (Online Appendix Figure A3 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). Shifts in 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. Given that polling officers are more directly involved in the administration of the identity verification and voting processes while the presiding officer has an overarching management role for the polling station and surrounding area, it could also be that differences in the position through which mixed composition occurs within a team will lead to impacts on different aspects of polling station proceedings.

In sum, shifting to a mixed team would be expected to decrease votes for the coalition more strongly aligned with homogeneous-team-type officers (here the BJP) and/or increase votes for the other coalition (here the RJD), with ambiguous predictions on total votes cast. Such effects would not necessarily imply an overall reduction in discriminatory behavior, and could occur both through changes in who is able to vote and choice of candidate among individuals who do vote. Section IV.D discusses additional non-officer-bias-related mechanisms.

C.2 Cross-station externalities

The presence of minorities on an officer team may also affect other polling stations, especially given that stations can be located within short distances of one another (see Figure 1 and Online Appendix Figure A4). 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 out-

comes. Alternatively, changes in team composition could impact the identity verification and voting process at nearby stations in a similar manner as within a given station if officers on teams in close proximity interact during election proceedings, or informational spillovers about what constitutes sufficient documentation for identity verification could take place across potential voters in neighboring polling stations. In such cases, a change in 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.

II Data and identification check

A 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,[14] covering 23,384 officers 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

[14] These districts contain 4 parliamentary constituencies and 19 sub-constituencies, and exhibit variation in terms of one each being higher and lower than the state level averages for urban, literate, and Scheduled Caste/Scheduled Tribe population shares.

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.

B 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.[15]

C 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 IV, were additionally included to generate 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.[16] 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.

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 860 officers were able to meet and provided consent to be surveyed. The rate of survey completion does

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

[16] 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.

not vary significantly by team composition for either survey.[17] Online Appendix B provides additional sampling details for both surveys.

D 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).[18] 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 sub-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. In addition, the likelihood of minority presence is increasing in the number of officers on a team, which is determined by the number of registered voters assigned to the polling station. However, conditional on team size, each polling station within a sub-constituency is equally likely to have minority officials posted to the officer team. In my subsequent analysis of impacts on polling-station-level voting outcomes, I therefore include sub-constituency-by-team-size fixed effects to exploit variation in team composition only within each sub-constituency across polling stations of the same officer 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:

$$Y_{pc} = \mu_{co} + \beta Mixed_{pc} + \epsilon_{pc}, \tag{1}$$

where Y_{pc} is an outcome of interest at polling station p in sub-constituency c and μ_{co} are sub-constituency-by-team-size fixed effects. $Mixed_{pc}$ is an indicator variable taking value 1 if at least one election officer team member is Muslim/Yadav and 0 otherwise. I also use this

[17] 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.

[18] 27.7 percent with a single Muslim/Yadav officer, 4.4 percent with two, and 0.3 percent with three.

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. 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. Section III.B describes how locations are defined. 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 in combination by either coalition (as defined in 2014) or in total, or in the vote share margin between the coalitions.[19]

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, Online 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 of Table 1, I test for balance in the random samples of surveyed potential 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

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

team polling stations are more likely to be female (approximately 46 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 (67 percent) and have prior polling station experience (66 percent).[20] No significant differences are observed in officer characteristics.[21]

III Impacts of officer team composition on voting

In Sections III.A and III.B, I identify the impacts of election officer team composition on voting within and across polling stations using variation from the natural experiment. I examine in Section III.C how effects are mediated by voter identity card coverage, and Section III.D conducts a counterfactual analysis of impacts on election outcomes.

A Within-station effects

Using the administrative vote returns data, Figure 2 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 2 shows that the presence of a minority officer on a polling station team significantly shifts the vote share margin toward the RJD by 2.5 percentage points, or 13.8 percent. Underlying the vote share impact, in columns (2) and (3) I observe that, with mixed team composition, the votes received by the RJD

[20] 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.

[21] 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 D considers potential differences in characteristics across officer types.

increase by 4.9 percent and decrease by 4.2 percent for the BJP on average. Finally, column (4) shows an insignificant average effect on log total votes cast.[22]

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.[23]

B 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.[24] Similar to the approaches of Miguel and Kremer (2004) and Callen and Long (2015), I estimate spatial externalities of team diversity with the specification:

$$Y_{pc} = \mu_{co} + \beta Mixed_{pc} + \gamma T_{pc} + \mathbf{N'_{pc}}\phi + \mathbf{X'_{pc}}\lambda + \epsilon_{pc}, \tag{2}$$

where T_{pc} is the total number of neighbors with a mixed officer team for polling station p in constituency c, and $\mathbf{N_{pc}}$ is a vector of the numbers of neighbors having each officer team size between three and five. Impacts associated with neighboring polling station density and

[22]The combined votes received by other parties increase by 0.2 percent (p-value = 0.922). In addition, the pattern of team composition impacts on voting outcomes is unchanged, though estimated less precisely, when each district is considered separately.

[23]Online 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. While the estimated impacts on voting are statistically significant and consistently larger in magnitude for Muslim/Yadav presence in a polling officer position, equivalence with the statistically insignificant presiding officer coefficients cannot be rejected. The table also shows insignificant differences between single and multiple Muslim/Yadav teams.

[24]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.

team size are captured by $\mathbf{N_{pc}}$, conditional on which 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 distribution 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 spillovers to longer distances using two different approaches. First, I supplement equation (2) with $\mathbf{N_{pc}^{0.25km}}$ and $\mathbf{N_{pc}^{0.25-0.75km}}$, the numbers of non-neighbor polling stations of different team sizes 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 total numbers of non-neighbor polling stations with mixed composition teams within these distances.[25] 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 (2) with variables for the numbers of non-neighbor polling stations of each officer team size and the total number with mixed teams within the same village as polling station p, $\mathbf{N_{pc}^{vill}}$ and T_{pc}^{vill}, and neighboring villages, $\mathbf{N_{pc}^{nei}}$ and T_{pc}^{nei}.[26]

The estimates of equation (2) in Table 3 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 2.7 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 3.3 percent increase in RJD votes and a significant

[25]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.

[26]The top 1 percent of the village distribution in terms of polling stations contained within has a mean of 119.2 as compared to the overall mean of 3.8, so the sample for this specification is trimmed to exclude polling stations located in or neighboring these villages, which are also more urban and large in area relative to typical villages.

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 Online 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 composition 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, 53 percent of officials report interacting with officers on the other team(s) during election day proceedings, and 65 percent indicate that their team coordinated with the other team(s) on management of the shared location.

C Heterogeneity in effects by voter identity card coverage

If changing team composition influences the administration of the voter identification process and the possession of voter identity cards by citizens reduces the scope of potentially discriminatory discretion available to officers, an attentuation of the impact of team composition on polling-station-level voting outcomes may be observed under high voter identity card coverage. I test for such a relationship using specifications of the form:

$$Y_{pc} = \mu_{co} + \beta Mixed_{pc} + \eta(Mixed_{pc} * ID_c) + \mathbf{X'_{pc}}\lambda + \epsilon_{pc}, \tag{3}$$

where ID_c is the proportion of registered voters in sub-constituency c with a voter identity card.[27] The top and bottom one percent of observations in terms of the vote share margin between the RJD and BJP are excluded from the sample.[28] Polling-station-level controls

[27] Sub-constituency is the lowest level for which administrative data on card coverage is available.

[28] The vote share margin between the coalitions at these polling stations is 88 percent or larger. Online Appendix Table A4 presents checks of robustness to trimming and winsorizing at different levels (including none).

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 voter identity card coverage weakens the effects of team composition 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: Muslim/Yadav registered voter proportion and the literate and Schedule Caste/Schedule Tribe population proportions.[29] Section IV.C presents additional, individual-level evidence on the relevance of voter identity card possession to the impacts of officer team composition on voting.

Columns (1) and (2) of Table 4 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 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 borderline significantly decreases by roughly 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 across sub-constituencies in my sample ranges between 76.3 and 93.9 percent, and state-wide between 76.3 and 95.6 percent. Figure 3 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. Online Appendix Table A5 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.

[29] Coefficients from a sub-constituency-level regression of voter identity card coverage on these characteristics are -0.187 (p-value = 0.043) for literacy, 0.295 (p-value = 0.009) for Scheduled Caste/Scheduled Tribe, and -0.156 (p-value = 0.148) for Muslim/Yadav.

D Can team composition influence who wins elections?

Having identified significant impacts of the religous/caste composition of 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 cross-station spillover effects, 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. Online Appendix B provides additional details.

I use these magnitudes to consider the effects of three alternatives to the current method of randomized officer assignment: (1) requiring mixed team composition in all polling officer teams, (2) excluding Muslim/Yadav officers from teams, and (3) having a Muslim/Yadav share of officers in each team position equivalent to the state-level share of the general population, given that these two groups are under-represented among polling station officers as compared to their proportions of the overall population.[30] During the 2014 elections, the RJD and BJP fielded the top two candidates in 29 of the 40 parliamentary constituencies in Bihar (Online Appendix Figure A5 provides the distribution of vote share margins). As shown in Table 5, 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, while outcomes

[30] Assuming a 31 percent Muslim/Yadav officer share in each team position and taking the same distribution of team sizes as observed in the two sample districts, Alternative 3 would in expectation yield approximately 78.7 percent mixed teams.

are unchanged under Alternative 3.

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), 28 (8) races are estimated to change to an RJD victory under Alternative 1, 5 (5) elections to switch in favor of the BJP under Alternative 2, and 20 (5) races to change to an RJD victory under Alternative 3.

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 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 roughly a 12 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 could have important downstream effects on outcomes directly relevant to citizen well-being.

IV Discrimination in election management

In Section IV.A, I test for own-group bias in the decision making of local-level election officials. I then examine in Section IV.B the perceptions of potential voters regarding biased officer behavior on election day, and in IV.C how their election day experiences are affected by officer team composition. Section IV.D considers additional mechanisms potentially contributing to the observed set of results.

A Vignette evidence of 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. Vignettes have been used previously to study

questions in electoral settings (Banerjee et al. 2014, Carlson 2015) 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 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.[31]

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:

$$Y_{qpc} = \varphi_n + \pi_v + \theta Match_{qpc} + \mathbf{X'_{qpc}}\lambda + \epsilon_{qpc}. \tag{4}$$

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).

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

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 4 shows a significant 0.24 point average increase in assessed voting ability likelihood when the potential voter is of the same type as the election officer. Table 6 presents the underlying estimates from equation (4). 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 4 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.[32] Overall, the vignette experiment results provide evidence suggesting own-group bias in the decision making of local-level election officials. In the following sections, I examine the election day experiences of potential voters and whether they are influenced by team composition in a manner consistent with the presence of such bias among officers at polling stations.

B List randomization: biased election-day 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 randomizations in the survey of potential voters to elicit information from them indirectly.

[32] Online Appendix Table A6 considers impacts separately by each officer type for which a name-type match was possible (Muslim, Yadav, Brahmin). For both the 4-point scale and 0-1 indicator outcome measures, the match indicator coefficients are positive across all officer types and equality of the coefficients cannot be rejected.

Two list randomization exercises were conducted, where surveyed individuals randomly assigned to the control group in one exercise were assigned to the treatment group in the second, and vice versa. In each list randomization, members of both groups were asked to indicate, from a list of statements read to them, only the total number of statements that occurred 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 exercises 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".[33]

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. 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. 2017).

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

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

identity), and surveyor and survey location fixed effects. In addition, to proxy for household wealth, the controls additionally include fixed effects for house construction type, livestock ownership, and electricity, running water, and toilet availability. Standard errors are clustered at the polling station level.

Table 7 presents the results of the list randomization exercises, 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 13.8 percent that election officers tried to influence voting activity 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 (Bertrand and Duflo 2016), the aim of this portion of the analysis is to consider generally the occurrence of biased officer behavior connected to religion and caste on election day. The results suggest that potential voters perceive that polling station officers attempt to influence voting behavior and religion and caste influence their treatment of voters.

C Differences in election day experiences

In this section, I conduct tests to disentangle more specifically 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 Muslim/Yadav and non-Muslim/Yadav individuals:

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

where Y_{wpc} is an outcome for respondent w at polling station p in sub-constituency c, and ID_{wpc} is an indicator for voter identity card possession.[34] The same set of controls is used as in 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.

Table 8 presents the results of equation (6) directly, while Figure 5 plots the estimated outcome value, assuming mean values of all control variables, for each of the four potential voter categories (minority-status-by-identity-card-possession), separately by whether they interacted with a homogeneous versus mixed officer team on election day. I first consider the likelihood of a potential voter being able to vote. Column (1) of Table 8 and the left panel of Figure 5a demonstrate that for minority individuals the probability of successfully voting is nearly identical across officer team types. This holds for individuals with or without identity cards, where the former group has a significantly higher probability of being able to vote than the latter. For non-minorities, team composition does not significantly impact voting ability among individuals with voter identity cards, as the right panel and column (2) show. However, shifting to mixed team composition significantly decreases average voting ability for non-minorities without identity cards by more than 10 percentage points, to a similar level as that for minorities.[35]

As it is not possible to observe what proportion of each category of potential voter would be allowed to vote at an ideal neutral polling station, I am unable to determine how a shift in team composition impacts overall discrimination along this dimension. In particular, the above reduction in voting ability at mixed team stations for non-minorities without identity cards would be consistent with settings where, for example: (i) minorities experience neutral identity verification and non-minorities are not treated stringently enough by homogeneous

[34] Coefficients from an individual-level regression of voter identity card possession on other individual-level characteristics and sub-constituency-level fixed effects are -0.004 (p-value = 0.637) for literacy, 0.013 (p-value = 0.127) for female, 0.002 (p-value = 0.793) for Muslim/Yadav, and 0.009 (p-value = 0.336) for livestock ownership.

[35] Mixed team composition has an insignificant average effect on overall ability to vote (p-value = 0.837), reflecting that non-Muslim/Yadavs without identity cards are a relatively small proportion of the population and offsetting insignificant increases in ability to vote are observed among individuals who possess identity cards.

teams, and proceedings at mixed team stations are closer to the ideal benchmark; or (ii) homogeneous teams behave neutrally toward all potential voters, but non-minorities are treated overly stringently by mixed teams.

In Figure 5b and columns (3) and (4) of Table 8, I next examine potential voters' own evaluation of their overall voting experience at the polling station on election day. I generate a variable for satisfactory experience that takes value 1 if a respondent indicates that her overall experience was "Excellent","Good", or "Fair", as opposed to "Poor". Similar to the above results, team composition has no significant impact for individuals with voter identity cards, who indicate having a satisfactory experience with very high probability. Among individuals without identity cards, non-minorities are a significant 5 percentage points less likely to have a satisfactory experience at mixed team stations while minorities experience an increase in probability of similar magnitude, though less precisely estimated.

Finally, I consider in columns (5) and (6) and Online Appendix Figure A6 potential effects on the polling station environment in terms of the absence of canvassing and disorderly behavior. I see no evidence of significant differences by team type for any of the potential voter categories, suggesting that differences in management of the area surrounding the polling station are not a primary channel through which officer team composition impacts polling station proceedings and voting outcomes.

These findings provide further evidence that team composition influences polling station proceedings and that voter identity cards play a critical role in mediating its impacts. Section III shows that changing from homogeneous to mixed team composition increases votes for the minority-oriented coalition and decreases votes for the non-minority-oriented coalition, reflecting effects on who is able to vote and/or choice of candidate among those able to vote.[36] Given that this section demonstrates that voting ability is significantly impacted only for non-minority individuals, the results taken together suggest that team composition has some influence on how individuals choose to vote as well.

[36]Online Appendix Table A7 shows, using the random sample of individuals initially contacted from the registered voter lists, that officer team composition does not significantly influence for either Muslim/Yadavs or non-Muslim/Yadavs the likelihood of going to the polling station on election day to attempt to vote.

D Alternative channels

Apart from influencing the likelihood and nature of biased behavior that local-level officials may exhibit in their election duties, changing the religious/caste composition of 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, Nickerson, and Owan 2003, Marx, Pons, and Suri 2016). 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.[37] 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, identity salience is unlikely solely to be driving the observed pattern of effects.

An additional possible concern in attributing the previously identified impacts in part 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 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

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

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 Online Appendix Table A8, 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.

V Conclusion

In this paper, I analyze, together with surveys conducted with election personnel and voters in India, a natural experiment that generated random variation in the religious and caste composition of the teams of officers managing polling stations on election day. Team composition influences voting within and across nearby polling stations, and the effects are large enough in aggregate to be relevant to election outcomes. I also provide evidence on one mechanism at work: own-group favoritism in the decision making of local-level election officials. To my knowledge, this is the first field-based experimental evidence of how government

personnel diversity can impact the provision of public services.

The related literature on reforms to strengthen elections has focused in large part on the benefits of advances in monitoring and voting technology. As the administration of Indian elections is technologically advanced and highly regulated, this paper makes a novel contribution in causally demonstrating the remaining importance, even near the present frontier of election practices, of the identities of local-level election personnel. It is not possible in the context considered in this paper to determine whether greater diversity within teams of election officers strengthens or further weakens the impartiality of polling station management, and mandating that mixed composition occur may not always be politically or administratively feasible regardless. My results, however, demonstrate that policies which restrict the scope for discretion in officer duties in the first place may be a promising alternative in reducing the ability of local-level election officials to discriminate on election day and influence voting outcomes.

Recent debate in the US electoral context over whether the increased prevalence of state-level voter photo identification requirements has differentially influenced minority turnout (Grimmer et al. 2017, Hajnal , Lajevardi, and Nielson 2017, Highton 2017) points to an important additional issue. While voter identity cards may be an effective means of reducing the scope for potentially-biased officer discretion in the voting process, the initial likelihood of possessing or costs of obtaining them may still systematically differ by voter type, allowing differential treatment across groups at the polls to persist. The Election Commission of India (ECI), which is widely considered an impartial and high-integrity body (Tharoor 2009, Vaishnav 2016), has together with its state-level offices implemented multiple initiatives in recent years to increase voter photo identity card coverage. The extent to which differences in identity card possession presently exist across groups in India more broadly is therefore unclear, and a rigorous analysis of the impacts of the ECI's efforts would be a valuable future exercise.

My results also highlight the importance of the initial composition of the populations of low-level government employees from which polling station officials are drawn, with additional policy implications. The expansion versus reduction of minority group quotas in public sector hiring is a topic of frequent public and government debate in India (Kishore

2016, Singh 2017). To the extent that such changes would influence the composition of the categories of state employees who serve as election officers,[38] the results in this paper suggest that policy makers should also account in their decision making for potential downstream effects on elections. Additionally, given that the randomization of officer teams has been scaled nationwide and states vary meaningfully along dimensions such as public corruption and caste-based politics, a natural extension of this research would be examining the effects of team composition across India more broadly to understand better how they may be mediated by characteristics such as institutional strength and the incentives of election officers.

More generally, this paper provides 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 underlying 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, Olken, and Pande 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.

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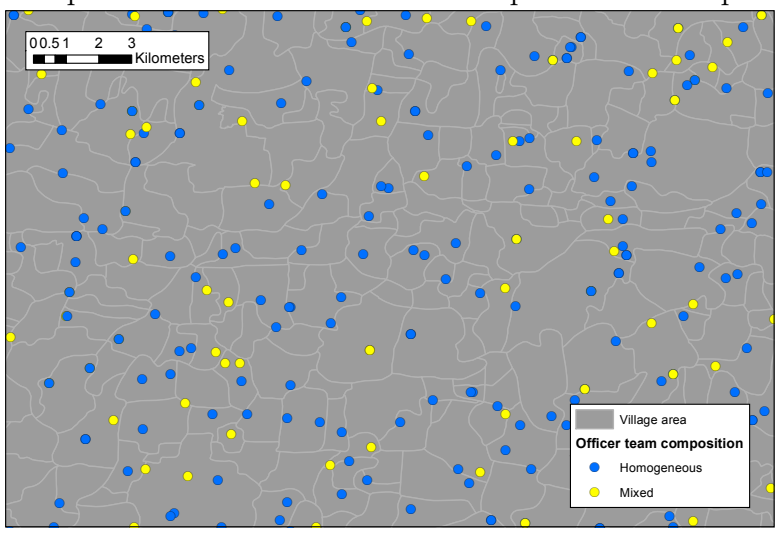
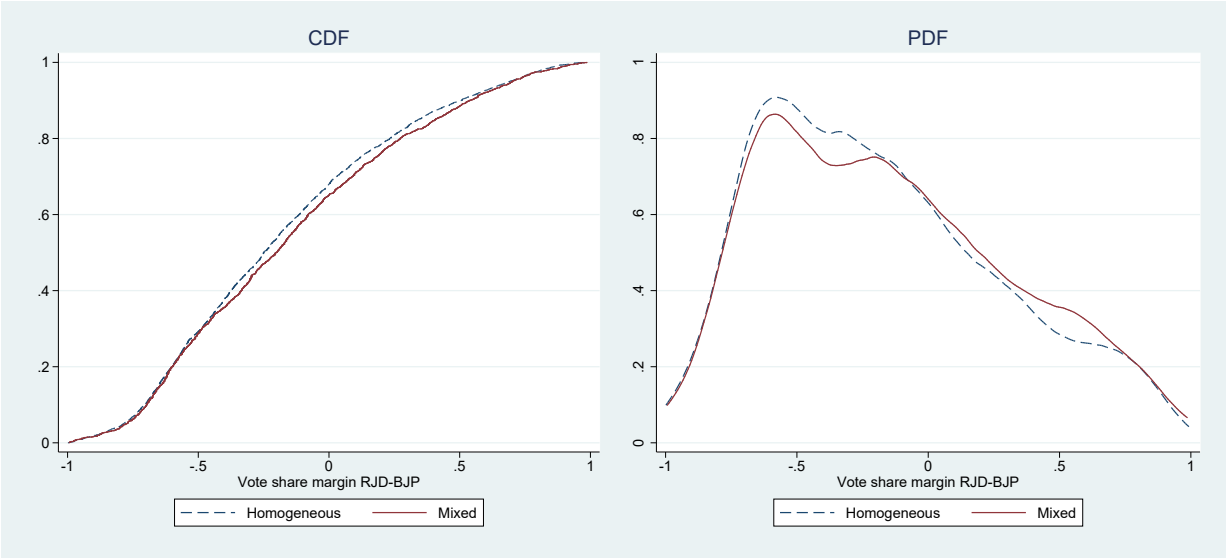
Figures and tables

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



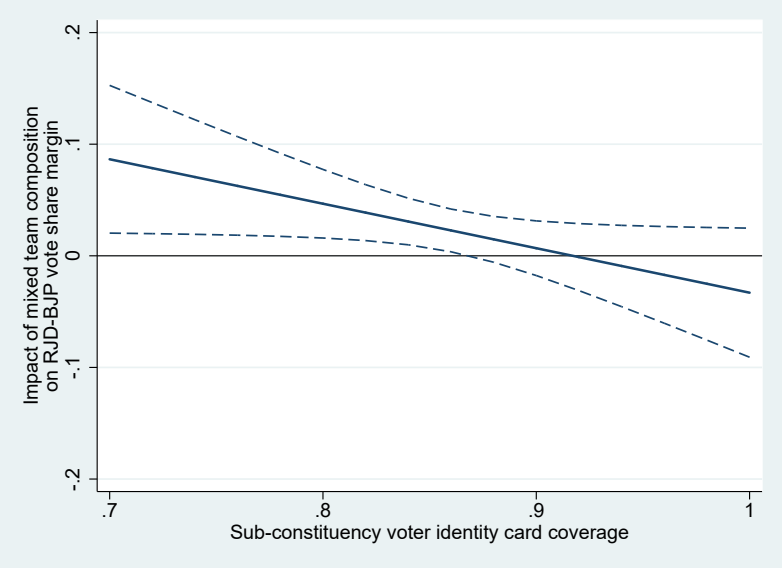
Notes: Each circle represents a polling station, with the color signifying whether the officer team is homogeneous or mixed in composition.

Figure 2: Distribution of coalition vote share margins by team composition



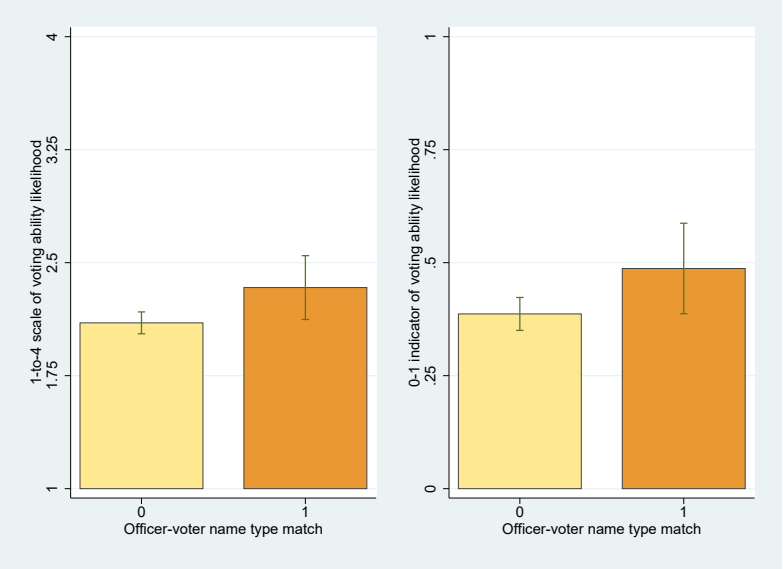
Notes: The figure plots the empirical cumulative distribution and kernel density estimates of the polling station-level vote share margin between the RJD and BJP coalitions, separately for polling stations with homogeneous (dashed line) and mixed (solid line) teams of polling stations officers. Density 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 3: 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 4.

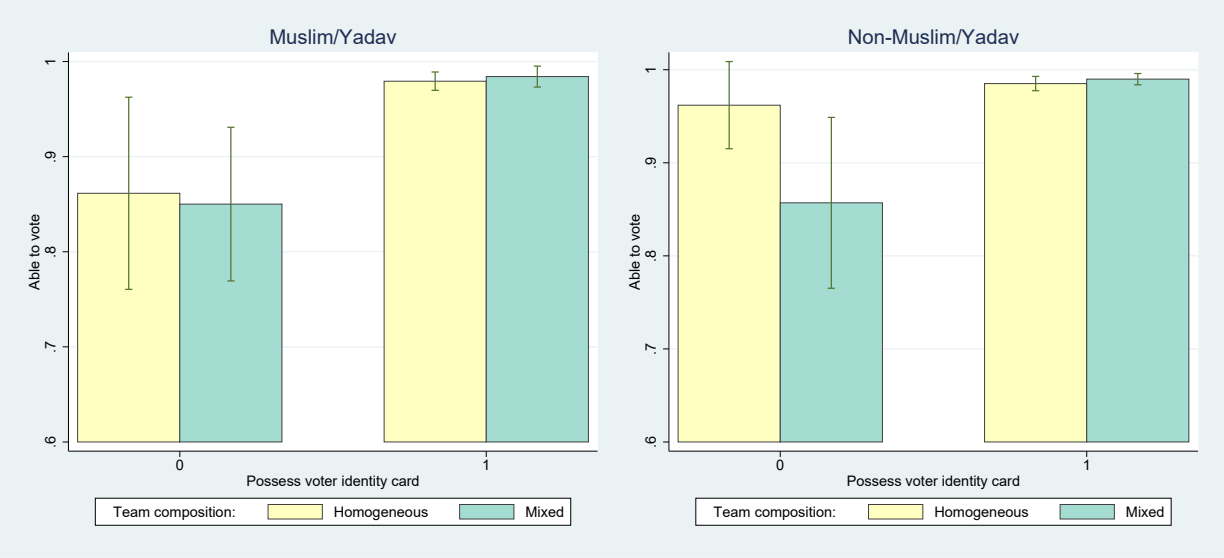
Figure 4: Own-type bias in officer assessment of voting qualification



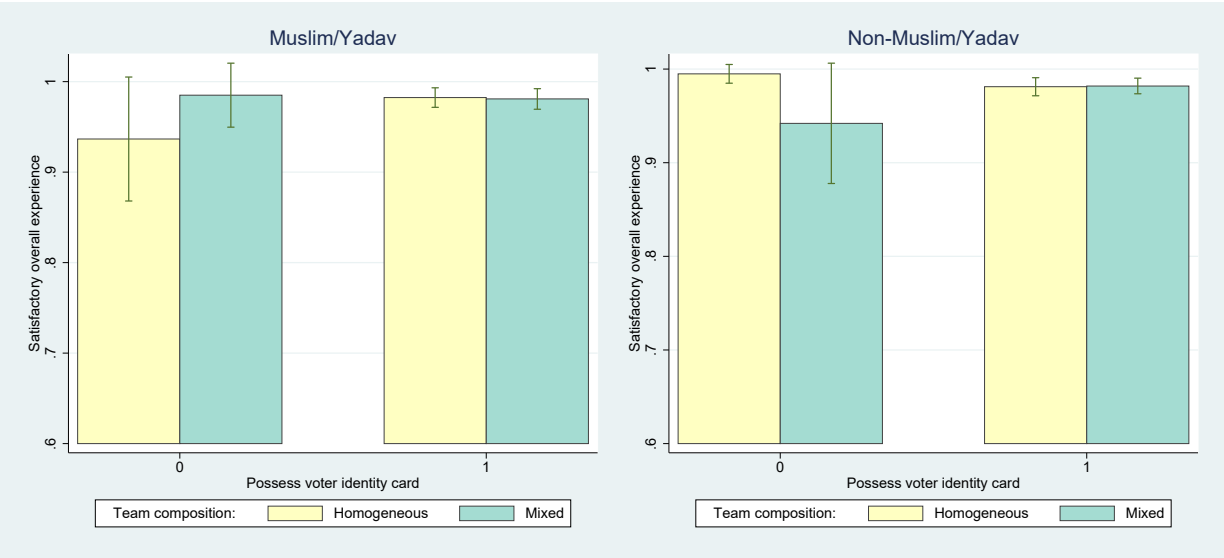
Notes: The left panel depicts the estimated 4-point-scale voting ability likelihood values given by officer respondents following the vignette. Estimates are based on the regression in column (1) of Table 6, assuming mean values of all control variables. The left bar represents the randomly assigned 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 6, assuming mean values of all control variables. Error bars signify 95 percent confidence intervals.

Figure 5: Election day experiences

a. Ability to vote



b. Satisfactory overall station experience



Notes: The left and right panels of each figure depict the estimated likelihood of the listed election day outcome, separately by type of potential voter (Muslim/Yadav, voter identity card possession) and polling station officer team composition. Estimates are based on corresponding regressions in Table 8, assuming mean values of all control variables. Error bars signify 95 percent confidence intervals.

Table 1a: Balance tests

	Homogeneous team (1)	Mixed team (2)	Difference (3)	Observations (4)
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	0.136	0.005	5,561
	[0.172]	[0.175]	(0.005)	
Panel B. Prior election characteristics				
Ln total votes	6.088	6.090	-0.002	5,275
	[0.334]	[0.318]	(0.009)	
Vote share margin RJD-BJP coalition	-0.288	-0.273	0.001	3,947
	[0.376]	[0.376]	(0.009)	
Ln votes RJD coalition	3.965	3.980	0.001	5,248
	[1.422]	[1.400]	(0.023)	
Ln votes BJP coalition	4.974	4.938	-0.004	3,946
	[0.985]	[0.993]	(0.024)	
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	1.504	1.543	0.001	5,197
	[3.180]	[3.291]	(0.082)	
Total stations within 0.25-0.75km	7.844	7.928	0.031	5,197
	[12.628]	[12.695]	(0.220)	
Total stations within village	3.682	3.731	0.070	3,213
	[5.496]	[5.674]	(0.208)	
Total stations in neighboring villages	14.223	14.337	0.009	3,213
	[10.562]	[10.462]	(0.367)	
Number mixed team neighbor stations	0.385	0.386	-0.011	5,561
	[0.746]	[0.719]	(0.018)	
Number mixed team stations	0.489	0.515	0.005	5,197
within 0.25km	[1.237]	[1.294]	(0.034)	
Number mixed team stations	2.528	2.613	0.047	5,197
within 0.25-0.75km	[4.249]	[4.380]	(0.080)	
Number mixed team stations	1.187	1.278	0.062	3,213
within village	[2.100]	[2.158]	(0.080)	
Number mixed team stations	4.647	4.729	-0.076	3,213
in neighboring villages	[3.851]	[3.906]	(0.134)	

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-by-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 0.25km, 0.25-0.75km, and village are non-neighbors located within those ranges 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.

Table 1b: Balance tests (cont.)

	Homogeneous team (1)	Mixed team (2)	Difference (3)	Observations (4)
Panel D. Potential voter characteristics				
Muslim/Yadav	0.425	0.440	0.021	4,242
	[0.494]	[0.497]	(0.017)	
Age	45.60	45.48	-0.09	4,211
	[16.86]	[16.46]	(0.58)	
Literate	0.380	0.408	0.017	4,241
	[0.486]	[0.492]	(0.017)	
Female	0.411	0.458	0.043**	4,243
	[0.492]	[0.498]	(0.016)	
Household head	0.457	0.461	0.004	4,243
	[0.498]	[0.499]	(0.018)	
Ln monthly household income	8.279	8.312	0.031	3,411
	[0.789]	[0.795]	(0.033)	
Voter identity card possession	0.945	0.941	-0.003	4,240
	[0.229]	[0.236]	(0.008)	
Panel E. Officer characteristics				
Age	42.29	43.73	1.35	490
	[9.66]	[9.73]	(0.91)	
College graduate	0.687	0.656	-0.036	489
	[0.465]	[0.476]	(0.044)	
Ln monthly salary	9.556	9.608	0.054	477
	[0.617]	[0.567]	(0.055)	
First time officer	0.360	0.324	-0.030	484
	[0.481]	[0.469]	(0.044)	

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-by-team-size 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.

Table 2: Impacts of randomized officer team composition on voting outcomes

	Vote share margin RJD-BJP (1)	Ln votes RJD (2)	Ln votes BJP (3)	Ln total votes (4)
Mixed team	0.025**	0.049*	-0.042**	0.002
	(0.010)	(0.027)	(0.021)	(0.008)
Muslim/Yadav registered voter percent	0.015***	0.031***	-0.030***	-0.000
	(0.000)	(0.001)	(0.001)	(0.000)
Ln total registered voters	-0.057**	1.006***	1.172***	0.937***
	(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-by-team-size fixed effects and controls for Muslim/Yadav share of registered voters and log total registered voters. Robust standard errors in parentheses.

Table 3: Cross-station externalities of officer team composition

	Vote share margin RJD-BJP (1)	Ln votes RJD (2)	Ln votes BJP (3)	Ln total votes (4)
Number mixed team neighbor stations	0.027***	0.033	-0.042*	0.004
	(0.010)	(0.028)	(0.020)	(0.008)
Mixed team	0.024**	0.048*	-0.041*	0.001
	(0.010)	(0.027)	(0.021)	(0.008)
Total three-officer neighbor stations	-0.325***	-1.003***	0.311***	-0.255***
	(0.035)	(0.104)	(0.072)	(0.029)
Total four-officer neighbor stations	-0.030***	-0.033***	0.047***	-0.013***
	(0.006)	(0.016)	(0.011)	(0.004)
Total five-officer neighbor stations	-0.043***	-0.093***	0.043***	-0.036***
	(0.011)	(0.032)	(0.023)	(0.016)
Observations	5,552	5,535	5,549	5,552
Number of locations	3,612	3,601	3,610	3,612

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 neighbors having each officer team size between three and five and the total number having mixed team composition. Neighbor stations are those located within the same building/compound. Additionally included are sub-constituency-by-team-size 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.

Table 4: 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 * Voter ID coverage percent	-0.004**	-0.007**	-0.009	-0.013	0.005	0.010*
	(0.002)	(0.003)	(0.005)	(0.008)	(0.004)	(0.006)
Mixed team	0.365**	0.556*	0.796*	1.029	-0.432	-0.970*
	(0.173)	(0.315)	(0.457)	(0.769)	(0.333)	(0.581)
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-by-team-size 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 and bottom one percent of observations in terms of coalition vote share margin. Robust standard errors in parentheses.

Table 5: Changes in election outcomes under alternative assignment mechanisms

	State assembly 2010		Parliament 2014		State assembly 2015	
	BJP to RJD victory	Vote share margin range	BJP to RJD victory	Vote share margin range	BJP to RJD victory	Vote share margin range
	(1)	(2)	(3)	(4)	(5)	(6)
All mixed teams	28	[-0.061, -0.0003]	1	-0.024	8	[-0.031, -0.003]
No mixed teams	-5	[0.004, 0.023]	-1	0.010	-5	[0.003, 0.010]
Proportional share of team positions	20	[-0.053, -0.0003]	0		5	[-0.025, -0.003]

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 three alternative officer assignment scenarios: (1) the presence of all mixed composition teams; (2) the absence of any mixed composition officer teams; and (3) Muslim/Yadav officer representation in each team position equivalent to the state-level population average. 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 6: 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.

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

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

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. Also 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, team composition, inferred type), the same set of polling station characteristics as in Table 6, 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 household electricity, running water, and toilet availability). Standard errors clustered at polling station level in parentheses.

Table 8: Election day experiences of potential voters

	Able to vote		Satisfactory overall experience		Orderly environment	
	Muslim/ Yadav	non-Muslim/ Yadav	Muslim/ Yadav	non-Muslim/ Yadav	Muslim/ Yadav	non-Muslim/ Yadav
	(1)	(2)	(3)	(4)	(5)	(6)
Mixed team * Voter ID	0.016	0.110**	-0.050	0.054*	-0.058	-0.009
	(0.066)	(0.053)	(0.040)	(0.032)	(0.069)	(0.052)
Mixed team	-0.011	-0.105**	0.048	-0.053*	0.065	-0.002
	(0.066)	(0.052)	(0.039)	(0.032)	(0.071)	(0.051)
Voter ID	0.085	0.022	0.035	-0.020*	0.064	0.004
	(0.056)	(0.025)	(0.038)	(0.011)	(0.060)	(0.044)
Female * Voter ID	0.077	0.003	0.026	0.015	-0.042	0.056
	(0.076)	(0.051)	(0.040)	(0.030)	(0.058)	(0.055)
Female	-0.093	-0.015	-0.040	-0.021	0.026	-0.049
	(0.075)	(0.051)	(0.040)	(0.030)	(0.058)	(0.053)
Observations	1,819	2,376	1,781	2,331	1,802	2,360
Omitted category outcome mean	0.909	0.980	0.955	1.000	0.909	0.872

Notes: All columns report OLS estimates from regressions at the individual level of the listed variable on an interaction of the mixed team polling station indicator with an indicator for voter identity card possession, for the sample of individuals indicated in each column. Additionally included are the same set of controls as in Table 7. Standard errors clustered at polling station level in parentheses.

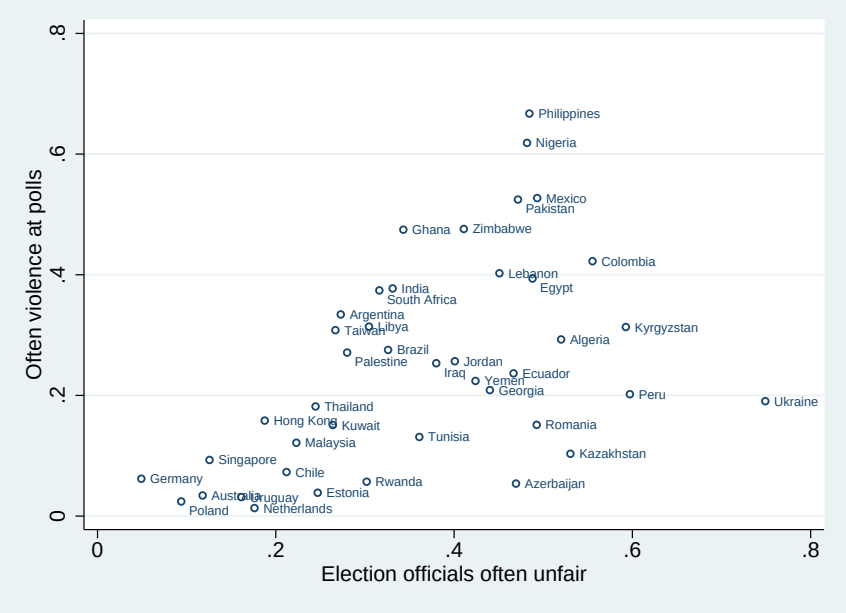
Table 9: Balance in characteristics by officer identity

	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	0.48	0.001
	(0.57)	(0.031)	(0.031)	(0.033)	(0.38)	(0.012)
Observations	859	838	859	853	6,034	6,198
Non-Muslim/Yadav outcome mean	43.05	9.583	0.671	0.341	44.94	9.291

Notes: All columns report OLS estimates from officer-level regressions 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.

Appendix A: additional figures and tables

Figure A1: World Values Survey – election administration problems



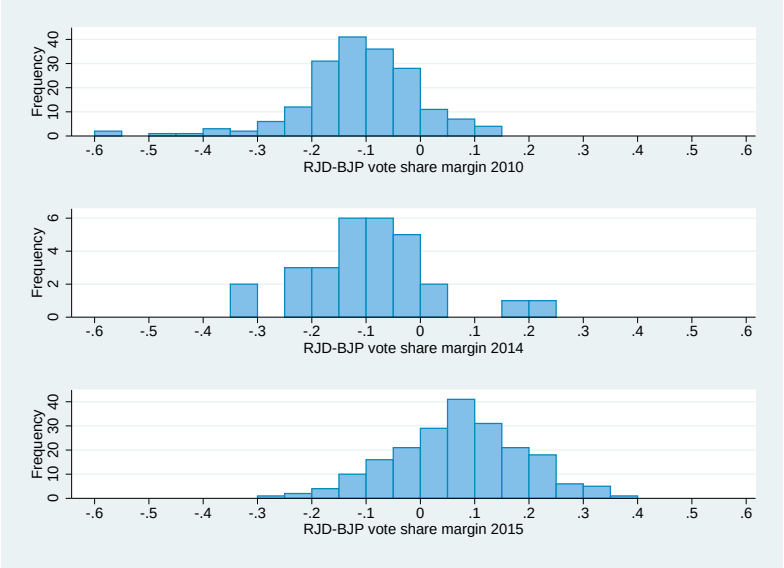
Notes: Measures computed using World Values Survey Wave 6 (2010-2014). "Election officials often unfair" is the weighted percentage of respondents in each country, when asked "In your view, how often do the following things occur in this country's elections?", answering "Not at all often" or "Not often" 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."

Figure A2: Example of polling officer team during election day proceedings

Figure A3: Example of government-issued voter identity card

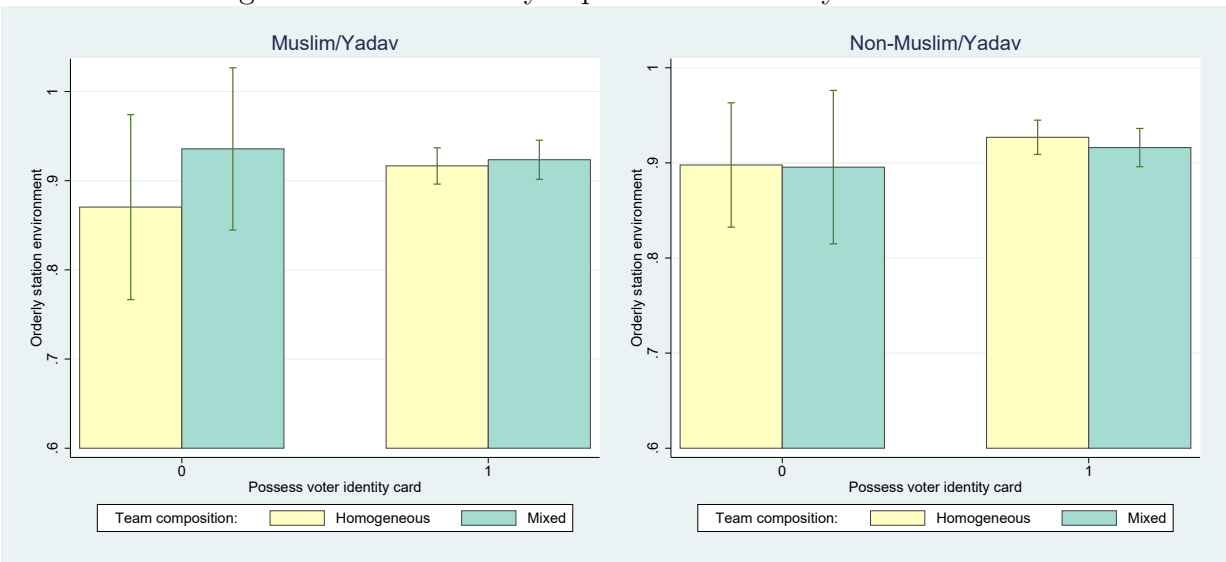
Figure A4: Example of neighboring polling stations in close proximity

Figure A5: 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 A6: Election day experiences – orderly environment



Notes: The left and right panels depict the estimated likelihood of the listed election day outcome, separately by type of potential voter (Muslim/Yadav, voter identity card possession) and polling station officer team composition. Estimates are based on corresponding regressions in Table 8, assuming mean values of all control variables. Error bars signify 95 percent confidence intervals.

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	0.006	-0.007	-0.018
		(0.014)	(0.014)	(0.014)	(0.029)
Muslim/Yadav polling officer 1	-0.007		-0.001	-0.019	-0.015
	(0.013)		(0.013)	(0.013)	(0.027)
Muslim/Yadav polling officer 2	0.006	-0.001		0.013	-0.009
	(0.014)	(0.014)		(0.015)	(0.026)
Muslim/Yadav polling officer 3	-0.006	-0.019	0.012		-0.020
	(0.013)	(0.012)	(0.014)		(0.029)
Muslim/Yadav polling officer 4	-0.016	-0.017	-0.011	-0.017	
	(0.026)	(0.030)	(0.030)	(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-by-team-size fixed effects. Robust standard errors in parentheses.

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. Presiding vs polling				
Muslim/Yadav presiding officer	0.009	-0.005	-0.017	-0.010
	(0.020)	(0.052)	(0.043)	(0.018)
Muslim/Yadav polling officer	0.034**	0.075**	-0.057**	0.007
	(0.012)	(0.031)	(0.024)	(0.009)
Observations	5,293	5,276	5,290	5,293
F-test p-value: equality of coeffs.	0.257	0.159	0.386	0.369
Panel B. Position				
Muslim/Yadav presiding officer	0.009	-0.005	-0.017	-0.010
	(0.020)	(0.052)	(0.043)	(0.018)
Muslim/Yadav polling officer 1	0.034*	0.094*	-0.019	0.017
	(0.019)	(0.050)	(0.037)	(0.011)
Muslim/Yadav polling officer 2	0.022	0.055	-0.065	0.001
	(0.020)	(0.052)	(0.044)	(0.014)
Muslim/Yadav polling officer 3	0.038	0.055	-0.086**	0.001
	(0.019)	(0.050)	(0.040)	(0.019)
Muslim/Yadav polling officer 4	0.068	0.173	-0.069	0.013
	(0.041)	(0.090)	(0.081)	(0.019)
Observations	5,293	5,276	5,290	5,293
F-test p-value: equality of coeffs.	0.657	0.439	0.649	0.632
Panel C. Number				
Any Muslim/Yadav officer	0.028***	0.058**	-0.047**	0.003
	(0.011)	(0.028)	(0.022)	(0.008)
Multiple Muslim/Yadav officers	-0.022	-0.059	0.037	-0.009
	(0.025)	(0.062)	(0.054)	(0.018)
Observations	5,552	5,535	5,549	5,552

Notes: All columns in Panel A and B report OLS estimates from polling-station-level regressions of the listed variable on indicators for Muslim/Yadav presence in the indicated polling party position(s), conditional on there being 1 or fewer total MY officers at the station. All columns in Panel C 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 the same controls as in Table 2. Robust standard errors in parentheses.

Table A3: Cross-station externalities – extended range

	Vote share margin RJD-BJP (3)	Ln votes RJD (1)	Ln votes BJP (2)	Ln total votes (4)
Panel A. Buffer radius				
Number mixed team neighbor stations	0.028***	0.039	-0.047**	-0.002
	(0.010)	(0.025)	(0.022)	(0.008)
Number mixed team stations within 0.25km	-0.005	0.015	0.021	0.007
	(0.008)	(0.023)	(0.015)	(0.007)
Number mixed team stations within 0.25-0.75km	-0.001	-0.005	-0.002	-0.002
	(0.004)	(0.008)	(0.007)	(0.002)
Mixed team composition	0.031***	0.059**	-0.056**	-0.001
	(0.011)	(0.028)	(0.022)	(0.008)
Observations	5,190	5,174	5,187	5,190
Number locations	3,378	3,368	3,376	3,378
Panel B. Village boundaries				
Number mixed team neighbor stations	0.053***	0.107*	-0.092**	0.011
	(0.019)	(0.053)	(0.044)	(0.013)
Number mixed team stations within village	0.016	-0.003	-0.051*	-0.001
	(0.015)	(0.039)	(0.029)	(0.007)
Number mixed team stations in neighboring villages	0.008	0.009	-0.014	0.004
	(0.006)	(0.014)	(0.011)	(0.003)
Mixed team composition	0.039***	0.089**	-0.070**	0.011
	(0.015)	(0.039)	(0.032)	(0.011)
Observations	3,209	3,193	3,207	3,209
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 polling stations within the various distances indicated that are mixed team composition and of each team size between three and five (not shown). Each regression includes sub-constituency-by-team-size 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.

Table A4: Heterogeneity by voter identity card coverage – outlier robustness checks

	Top and bottom percentile				
	1	0.5	0.75	1.5	None
	(1)	(2)	(3)	(4)	(5)
Panel A. Trim					
Mixed team * Voter ID coverage percent	-0.007**	-0.006*	-0.007**	-0.005*	-0.006*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Mixed team	0.556*	0.488	0.568*	0.459*	0.486
	(0.315)	(0.321)	(0.318)	(0.312)	(0.322)
Observations	5,442	5,498	5,470	5,386	5,552
Interacted sub-constituency controls	X	X	X	X	X
Panel B. Winsorize					
Mixed team * Voter ID coverage percent	-0.006*	-0.006*	-0.006*	-0.006*	
	(0.003)	(0.003)	(0.003)	(0.003)	
Mixed team	0.490	0.487	0.488	0.490	
	(0.321)	(0.322)	(0.322)	(0.320)	
Observations	5,552	5,552	5,552	5,552	
Interacted sub-constituency controls	X	X	X	X	

Notes: All columns report OLS estimates from regressions at the polling station level of the RJD-BJP coalition vote share margin 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 the same controls as in the even-numbered columns of Table 4. Panel A the trims and Panel B winsorizes the top and bottom percentiles of observations in terms of coalition vote share margin as specified in each column heading. Robust standard errors in parentheses.

Table A5: Cross-station externalities and heterogeneity by voter identity card coverage

	Vote share margin RJD-BJP	
	(1)	(2)
Mixed team * Voter ID coverage percent	-0.004*	-0.006*
	(0.002)	(0.003)
Number mixed team neighbor stations * Voter ID coverage percent	-0.003	-0.005*
	(0.002)	(0.003)
Mixed team	0.356**	0.506
	(0.174)	(0.312)
Number mixed team neighbor stations	0.266	0.488*
	(0.178)	(0.259)
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 in the first and second columns are the same controls as in the odd- and even-numbered columns of Table 4, respectively. Sample trims top and bottom one percent of observations in terms of coalition vote share margin. Standard errors clustered at the location level in parentheses.

Table A6: Vignette experiment – heterogeneity by officer type

	Ability to cast vote	
	4-point scale	0-1 indicator
	(1)	(2)
Muslim officer/potential voter type match	0.088	0.022
	(0.175)	(0.086)
Yadav officer/potential voter type match	0.271	0.160
	(0.197)	(0.099)
Brahmin officer/potential voter type match	1.099**	0.339
	(0.541)	(0.213)
Observations	818	818
F-test p-value: equality of coeffs.	0.200	0.309

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 indicator variables for whether the officer's own type matches that of the randomly assigned voter name (Muslim, Yadav, Brahmin), separately by each officer type for which a voter name match was possible. 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. Controls are the same as in Table 6. Standard errors clustered at the polling station level in parentheses.

Table A7: Impacts on attempting to vote

	Went to station on election day	
	Muslim/ Yadav	non-Muslim/ Yadav
	(1)	(2)
Mixed team	0.017	-0.007
	(0.011)	(0.011)
Observations	1,946	2,620

Notes: Each column reports OLS estimates from an individual-level regression of the listed variable on the mixed team polling station indicator, for the sample of individuals indicated in each column. Additionally included are the same set of controls as in Table 8, with the exception of the individual- and household-level characteristics, which are not available for individuals who indicated they did not go to the polling station on election day. Standard errors clustered at the polling station level in parentheses.

Table A8: Type-specific impacts of officer identity on voting outcomes

	Vote share margin RJD-BJP (1)	Ln votes RJD (2)	Ln votes BJP (3)	Ln total votes (4)
Any Muslim officer	0.024**	0.055*	-0.035	0.012
	(0.012)	(0.030)	(0.024)	(0.008)
Any Yadav officer	0.045**	0.065	-0.104**	-0.034
	(0.022)	(0.057)	(0.044)	(0.025)
Observations	5,293	5,276	5,290	5,293
F-test p-value: equality of coeffs.	0.378	0.872	0.146	0.065

Notes: All columns report OLS estimates from polling-station-level regressions 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 the same controls as in Table 2. Robust standard errors in parentheses.

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 randomizations

Introductory 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 available 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). Neither the rate of consent (>99 percent) among reachable individuals nor the overall proportion of primary versus backup respondents 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 percent). 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. The rate of final consent (>98 percent) among reachable individuals in this set of officers does not differ significantly by whether the polling station is mixed versus homogeneous team.

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 approximated by 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. The distribution of neighbors by officer team size is not available outside of the two sample districts. The results of the spatial externality regressions in Section III.B, however, are nearly identical when the overall number of neighbors is used as a control instead of separating by team size. In addition, the neighbor and identity card coverage data were not yet available for the 2015 elections, so the 2014 values are used for that election cycle.

Taking the coefficients from a modified version of equation (3) allowing for cross-station spillover effects, estimated on the sample districts for which I possess officer assignment information,

$$Y_{pc} = \mu_c + \theta_o + \beta Mixed_{pc} + \gamma T_{pc} + N_{pc} + \beta_2 \left[Mixed_{pc} * ID_c\right] + \gamma_2 \left[T_{pc} * ID_c\right] + \phi_2 \left[N_{pc} * ID_c\right] + \epsilon_{pc},$$

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.