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**How Do Caste, Gender and Party Affiliation of Locally
Elected Leaders Affect Implementation of NREGA?**

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The views expressed in this paper are entirely those of the author and should not be attributed to the Institution with which he is associated. Doug Johnson is a senior researcher in the Sector Wide and Policy Unit at the Centre for Micro Finance.



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Abstract

We estimate the impact of the caste, gender, and party affiliation of locally elected leaders on implementation of India's new workfare program for rural areas, the National Rural Employment Guarantee Act (NREGA), in Andhra Pradesh (AP), a state in Southern India. While, for most castes, we find a modest increase in participation by members of the same caste of the leader in the program, we find no impact on a broad range of other program outcomes or any effect of reservations for women. Our results suggest that NREGA in AP may be less susceptible to capture than other government programs.

1 Introduction

In 2006, the government of India passed a law guaranteeing each and every rural household in the country one hundred days of work at a basic minimum wage. The law, known as the National Rural Employment Guarantee Act (NREGA), in effect created India's (and probably the world's) largest anti-poverty program as measured by the number of beneficiaries. According to official statistics, 45 million households participated in NREGA in fiscal year 2008-09.¹

In this paper, we attempt to estimate how the caste, gender, and party affiliation of locally elected leaders affect implementation of NREGA along a variety of dimensions for the state of Andhra Pradesh. These effects may be of interest to policymakers and researchers for two primary reasons. First, if the characteristics of locally elected leaders affect participation in NREGA it may

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¹See <http://www.igovernment.in/site/India-redesigns-rural-self-employment-scheme/>

be indicative of a breakdown in the mechanism for providing work to potential beneficiaries. In principle, participation in NREGA should depend solely on the demand for work by households which is unlikely to be affected by what type of leader is in power at the local level. In practice, village leaders may discriminate in favor of workers of the same gender or caste or officials one step up may funnel more money to villages in which the leader shares the same party affiliation as them. Indeed, researchers have found that in the case of other government programs in India, the identity of the local leader does matter when it comes to implementation. Besley et al (2004) find that villagers in Southern India benefit from increased provision of a variety of different public goods if a leader of their same caste is in power. Yet proponents of NREGA argue that by forcing beneficiaries to work for their benefits, NREGA is less susceptible to issues of capture than other government programs.

Second, this analysis may shed light on how the preferences of different castes and men vs. women differ when it comes to how NREGA is implemented. According to classical median voter theory, if candidates for office can commit to policies ex ante, the caste or gender of the elected leader will not affect policy outcomes. There is now limited research to show that the identity of leaders does in fact influence policy outcomes. Chattopadhyay and Duflo (2004) show that mandating that a portion of village leaders be women resulted in a shift in the types of investments made by the governments of these villages away from things like education, which women benefit less from, and more towards public infrastructure such as roads. The data used in this paper allows us to further extend this line of enquiry by looking at how the preference of leaders of different castes or genders differ when it comes to segregation. Within villages, NREGA work is typically broken up into several different worksites allowing us to come up with a measure of the overall segregation of castes or genders across worksites.

In attempting to estimate the effect of the caste, gender, and party affiliation of a leader on his or her leadership we are confronted by a seemingly intractable problem: the identity of a leader is highly endogenous. Voters certainly take into account candidates' caste, gender, and party affiliation when casting their vote.² Thus, a simple comparison of the policies adopted by locally elected leaders of one caste, gender, or party vs. another is more likely to turn up differences in the preferences of the electorate rather than the causal effect of these characteristics. In the case of caste and gender, to overcome these problems of endogeneity we take advantage of a law enacted by the Indian government which mandates that a certain proportion of sarpanches, or locally elected village council leaders, be reserved for women and members of what were traditionally referred to as "lower castes". In Andhra Pradesh, the system of reservations was implemented in such a way that the current allocation of reservations for minorities is, conditional on the share of the population which the minority represents in the village, sub-district, and district, random. This randomness allows us to estimate precisely the causal effect of reserving a sarpanch seat for a minority.

²It is often said that in India voters do not cast their vote but rather they vote their caste.

The disadvantage of employing this strategy is that the estimates provided are of the effect of reserving a sarpanch seat for a woman or minority caste rather than the causal effect of the sarpanch's gender or caste. As Chattopadhyay and Duflo (2004) point out, these two effects may not be identical for several reasons. In particular, sarpanches elected in reserved seats are often younger and less experienced in office than sarpanches elected in unreserved seats. Further, sarpanches from reserved seats are much less likely to win reelection than those from unreserved seats. For purposes of investigating whether NREGA is subject to capture, the fine distinction between the effect of reserving a seat for a particular caste or gender and the effect of the caste or gender of a leader is relatively unimportant.

To determine the causal impact of party affiliation on NREGA implementation we exploit another source of pseudo-randomness inherent in the electoral process itself. As the margin of victory in an election approaches zero, constituencies in which a party won are unlikely to differ, on average, from constituencies in which the party lost. Thus, comparing NREGA outcomes in constituencies where the party barely won with outcomes in constituencies in which the party barely lost may yield the causal effect of the party achieving power subject to the assumptions that these two sets of constituencies are similar on average. Using returns from the latest election to sub-district councils, we identify a set of extremely close races in which the ruling party, Congress, barely won or barely lost the council seat. We then compare overall levels of participation in NREGA in these two sets of constituencies, flexibly controlling for the margin of victory / defeat for Congress and several other factors.

Surprisingly, our analysis reveals that the caste, gender, and party affiliation of local leaders affect implementation of NREGA only marginally. For most castes, reserving a local sarpanch seat for a member of that caste marginally increases the proportion of the caste in the overall number of workers point but does not influence the average wages of the group, the types of projects taken up, or the levels of worksite segregation whatsoever. Reserving a sarpanch seat for a woman has no appreciable effect on any of our outcome variables. Likewise, we find no evidence that district or sub-district officials reward supporters by channeling more NREGA funds to constituencies in which a sub-district council member from the ruling party was elected.

It's often said that "when all you have is a hammer, everything looks like a nail." The analysis included in, in some sense, the authors' attempt to whale away at the edifice of NREGA using the analytical hammers at our disposal. To the authors' surprise, NREGA in AP revealed few cracks under this pressure. The results suggest the mechanism for providing work under NREGA may be more resilient to capture by specific groups or parties than other government programs.

2 Ways in Caste and Gender Reservations and Party Affiliation of Local Leaders May Affect NREGA

There are several ways in which reservations for a specific caste or gender or party affiliation of a locally elected leader may, theoretically, affect the implementation of a public program like NREGA. We highlight several salient ones, though by no means all, below.

First, it may lead to capture by members of the caste, gender, or party of the leader. Leaders may discriminate in favor of members of their own caste when determining who gets to participate in the program or may funnel illicit gains from the program towards members of their own caste.

Second, participants in the program themselves may have different preferences regarding the program and may choose to participate more or less depending on the type of locally elected leader in power. For example, upper caste potential participants may shy away from participating in a program if the program is managed by an SC or ST.

Third, leaders of different castes, genders, or parties may have different preferences regarding the implementation of the program. Chattyodyay and Duflo (2001) find that women leaders tend to spend more on infrastructure projects and less on education.

Fourth, if leaders higher up in the hierarchy display positive or negative prejudice towards members of certain castes, genders, or parties, then overall program implementation may be affected by a leader's identity even if the leader's identity does not directly influence how he or she manages the program.

Fifth, reservations may lead to less effective implementation due to the relative inexperience and lower electoral incentives of sarpanches in reserved seats. As mentioned above, Chattyodyay and Duflo (2004) show that sarpanches in reserved seats tend to be less experienced politically and less likely to win re-election than sarpanches in unreserved seats.

The above list is by no means exhaustive. There are numerous other ways in which reservations or a leader's party affiliation may influence NREGA outcomes not listed here. We have limited this list as we do not have the capacity to distinguish between these, or most other, effects. Yet for purposes of determining whether NREGA is fulfilling its promise of providing guaranteed employment it is not necessary that we distinguish between all of these effects. Aside from effects which operate via the mechanism of people's preferences, all other effects imply a breakdown in this employment guarantee.

3 Background

3.1 Panchayati Raj Institutions in Andhra Pradesh

The locally elected leaders whose policies are analyzed in this paper are all part of a system of local bodies known as the Panchayati Raj. The Panchayati Raj is composed of three tiers of locally elected bodies – Gram Panchayats, Intermediate Panchayats, and District (Zilla) Panchayats – which collectively administer a diverse array of government programs.

Gram Panchayats are the lowest tier of the Panchayati Raj (“gram” means village in Hindi) and typically contain between one and five villages. The Gram Panchayat itself is a council comprising between one and twenty ward members and a single “sarpanch” (pradhan), or leader. In Andhra Pradesh, both ward members and sarpanches are directly elected. In addition to their responsibilities in administering NREGA (described below), Gram Panchayats also are responsible for deciding how to spend funds from several other national development programs. Crucially for our purposes, in each election, a portion of sarpanch seats are reserved for women, members of the scheduled caste (SC) community, members of the scheduled tribe (ST) community, and members of the backward caste (BC) community.³ The proportion of sarpanch seats reserved for female candidates is fixed throughout the state at one third. The proportion of sarpanch seats reserved for SC, ST, and BC candidates varies by sub-district according to the share of the general population these communities represent in the sub-district. According to Besley et al (2004), reservations for sarpanch seats are effectively random in Andhra Pradesh.

Intermediate Panchayats represent the second tier of the Panchayati Raj and typically contain a single sub-district. In AP, sub-districts are known as “mandals” and thus intermediate panchayats as referred to as mandal committees or “mandal parishads”. Mandal parishads consist of between one and twenty mandal parishad territory councilors (MPTCs) and a single mandal parishad president (MPP). MPTC constituencies typically map to a single Gram Panchayat but in cases where the a Gram Panchayat is sufficiently large (more than 10,000 voters) it may be broken up into one more MPTC constituencies or, more rarely, if the Gram Panchayat is sufficiently small (less than 2,500 voters) it may be combined with one or more other Gram Panchayats to form a single MPTC constituency. MPTCs are directly elected but MPPs are indirectly elected by MPTCs from among their ranks. Mandal Parishads have relatively few formal responsibilities but often exert a considerable amount of influence over how development funds from the centre are spent.

The uppermost tier of the Panchayati Raj system is the district or Zilla Panchayat. In AP, as in most other states, Zilla Panchayats wield little influence

³The terms scheduled caste, scheduled tribe, and backward caste derive from the traditional caste system in Hinduism. Scheduled castes make up those castes which were historically most oppressed under the caste system. Scheduled tribes are made up people from non-Hindu indigenous tribes whom historically, have also been very oppressed. Backward castes are those castes which fall slightly above scheduled castes in the traditional caste hierarchy.

as they are overshadowed by the powerful district collector.

Elections to all levels of the Panchayati Raj are held approximately every five years. The most recent panchayat election in Andhra Pradesh was held in the summer of 2006.

3.2 NREGA

The National Rural Employment Guarantee Act, passed by the United Progressive Alliance (UPA) government in 2005, is one of the largest and most ambitious anti-poverty schemes adopted by the Indian government since independence. The act provides a legal guarantee of 100 days of work a year at a minimum wage to all households in India willing to perform unskilled manual labor. According to the act, any household seeking work must be provided with employment within 15 days or else be paid a daily unemployment allowance until work is found. NREGA has been selectively rolled out in three phases, starting with the 200 most backward districts in India, over the past two and a half years and now is being implemented in all districts nationwide.

Responsibility for the immense task of generating sufficient work for all who demand it and for supervising worksites is delegated to the Panchayati Raj Institutions in the act. Gram Panchayats are tasked with estimating local demand for work, suggesting suitable projects, issuing job cards for new job seekers, monitoring worksites, and implementing at least 50% of worksites. Intermediate (Block / Mandal) Panchayats are responsible for ensuring that job seekers are provided with work within 15 days and identifying appropriate works if the GP fails to do so. (In some states, these responsibilities have been legally devolved to the GPs.) District (Zilla) Panchayats are required to develop five year plans based on overall district needs and to coordinate NREGA activities at the district level. (Right to Food, 2005)

In practice, implementation of NREGA has varied greatly from state to state. Table 1 lists key figures related to implementation of NREGA by state in India for the most recent fiscal year. As the table shows, there is wide disparity in the overall rates of participation in NREGA.

3.3 NREGA in Andhra Pradesh

Andhra Pradesh (AP) was chosen for this study due to the fact that it is the only state which has made available detailed records of each participant in NREGA to the public over the internet. This fact alone provides some indication of how NREGA has been implemented in the state. In terms of transparency, the implementation of NREGA by the state government has been exemplary. AP is the only state to have established an independent agency to promote and oversee local audits of NREGA. Initial reports, as well as the anecdotal experience of the authors, indicate that this system has been highly effective in controlling corruption in the scheme. (Aakela and Kidambi, 2007) AP is also the only state to have implemented an advanced information system for tracking participation data. (It is from this system that the data used in this report was gathered.)

Andhra Pradesh also differs from other states in that a large portion of responsibility for implementation of NREGA has been assigned to unelected officials at the mandal level. While the text of the National Rural Employment Guarantee Act stipulates that Gram Panchayats are responsible for proposing new projects, estimating demand for work, and supervising worksites, in AP a large share of the responsibility for these tasks lies with the Mandal Parishad Development Officer (MPDO), an appointed mandal level official, and the mandal level engineers who report to the MPDO. Gram Panchayats still maintain a large share of control over the implementation of NREGA, but this control is less than in most other states.

Figure 1 provides a map showing which districts were in which phase of the NREGA rollout.

4 Data

Data on participation in NREGA has been gathered from the official Andhra Pradesh state NREGA web portal. The AP NREGA web portal provides extremely detailed work records for each individual participant for each week of work. This data has been aggregated at the Gram Panchayat and mandal levels. Table 2 presents summary statistics for participation in NREGA in AP from this data. Table 3 presents caste-wise statistics for NREGA participation for phase one districts. As the table shows, SCs and STs are disproportionately represented among NREGA workers. As rates of poverty are extremely high among these groups, this is in line with expectations.

Data on caste and gender reservations for sarpanch seats comes from the Andhra Pradesh State Election commission. This data contains information on whether the sarpanch seat and each ward councilor seat within a Gram Panchayat was reserved for a candidate of a specific gender or caste but does not contain information on election results such as the caste or gender of winners of sarpanch races in unreserved seats. Reservations data has been merged with NREGA participation data based on the name of the Gram Panchayat using a fuzzy name matching algorithm. Out of 21,111 total Gram Panchayats for which we have data on NREGA participation, we were able to match 14,074. Table 4 presents summary statistics for the set of Gram Panchayats for which we were able to match NREGA data and reservations data along with statistics for the set of unmatched Gram Panchayats from either dataset. Due to the immense sample size, differences between merged and unmerged Gram Panchayats are statistically significant for nearly all of the variables reported here. In the case of merged and unmerged reservations data (the first two columns), the differences, while statistically significant, are extremely minor. Thus we may have confidence that our results are internally valid. The differences between the merged and unmerged NREGA data are both statistically and practically significant. Thus, we may have less confidence that our in sample estimates of the effect of reservations are equally valid for the 7,000 odd Gram Panchayats which we were unable to match.

Data on MPTC elections come from the Andhra Pradesh State Election commission as well. Our dataset on MPTC races includes total number of votes and party affiliation of each candidate for each MPTC race. MPTC data has been merged with the NREGA data described above as well as with panchayat-wise population statistics gathered from the BPL census.⁴ Merging MPTC data with NREGA and BPL census data presented several difficulties. First, MPTCs constituencies do not necessarily correspond to a single Gram Panchayat. As described above, Gram Panchayats whose populations exceed 10,000 voters (about 15% of Gram Panchayats) are split up into two or more MPTC constituencies. Second, merging this data with an additional dataset solely on the basis of the name of the Gram Panchayat proved trying as these names are not spelled consistently across datasets. For these reasons, and because regression discontinuity requires only a sufficient set of observations just above and below the cutoff point, we have only attempted to manually merge MPTC data with BPL census and NREGA data for those MPTC races which were extremely close for the Congress party (margin of victory / loss less than two percent) and for which the MPTC constituency corresponded to a single Gram Panchayat. Out of 497 such MPTC races, we were unable to manually match over 90% with BPL census and NREGA data leaving a dataset of 445 complete observations.

5 Empirical Strategy

5.1 Estimating the Impact of Reservations for BC, SC, ST, and Women

As reservations for women in sarpanch seats are allocated randomly, our empirical strategy for the estimating the effect of reserving a sarpanch seat for a woman on NREGA outcomes is straightforward and given by:

$$Y_{dmp} = \alpha + \gamma R_{dmp} + \varepsilon_{dmp} \quad (1)$$

where subscript d indexes district, subscript m indexes mandal, subscript p indexes Gram Panchayat, Y_{dmp} is our outcome measure of interest, and R_{dmp} is a dummy variable equal to one if the sarpanch seat is reserved for a woman.

Our empirical strategy for estimating the effect of reserving a sarpanch seat for a member of the SC, ST, or BC communities is only marginally more complicated. Unlike in the case of reservations for women, reservations for members of oppressed caste groups vary by mandal according to the share of the general population represented by that caste group. Since our dataset does not include information on the population of the Gram Panchayat we utilize the proportion of sarpanch seats in each mandal which have been reserved for a caste group as a proxy for the share of the general population represented by that caste group.

⁴In India, two separate nationwide censuses are carried out on a regular basis: the national census and the BPL, or “Below Poverty Line”, census. National census statistics are considered more reliable but do not contain population statistics aggregated at the Gram Panchayat level. For this reason, we have used BPL census statistics here.

In addition, we also include measures of the proportion of ward seats which have been reserved for the caste group in the Gram Panchayat and in the district as a whole in order to pick up any remaining effects of local demographics on the probability that a sarpanch seat will be reserved for a caste minority. Table 6 presents results from a simple regression of sarpanch reservation status on these variables. The results demonstrate that there is a high degree of correlation between the reservation status of a sarpanch seat and the share of sarpanch seats in the mandal at large reserved for each caste group.

Our regression equations for the impact of reserving a sarpanch seat for a caste group on NREGA outcomes are thus:

$$Y_{dmp} = \alpha + \gamma R_{dmp} + \beta_1 SHAREGP_{dmp} + \beta_2 SHAREMANDAL_{dm} + \beta_3 SHAREDIST_d + \varepsilon_{dmp} \quad (2)$$

where R_{dmp} is now a dummy for whether the sarpanch seat is reserved for the relevant caste, $SHAREGP_{dmp}$ is the proportion of ward seats in the Gram Panchayat reserved for the caste, $SHAREMANDAL_{dm}$ is the proportion of sarpanch seats reserved for the caste in the mandal, and $SHAREDIST_d$ is the share of total ward seats in all Gram Panchayats in the district reserved for the caste.

We estimate these sets of equations for four fairly straightforward independent variables: the proportion of women or the relevant caste group among the total NREGA workforce, the average wage of women or the relevant caste group, and average days worked by women or the relevant caste group.

In addition to these four variables, we have also constructed indices of caste and gender segregation at the Gram Panchayat level which reflect the overall degree to which workers of different castes or genders are segregated between worksites. A description of the method used to calculate these indices is included in Appendix A but several key points regarding these indices should be made here. First, our segregation indices only capture segregation between worksites and not over time. If, for example, workers of one caste group worked at all worksites for two days out of the week, workers of another caste group worked at all worksites another two days out of a week and so on, our caste segregation index would still indicate that levels of caste segregation were low. Second, in many (but not all) Gram Panchayats official worksites which do not correspond to physical worksites are often created for purely administrative purposes. The presence of these extra worksites adds a lot of noise to our indices.

To estimate the effect of reservations for women on gender segregation, we need no additional equations. In the case of caste segregation, we require one additional equation which includes reservation and demographic variables for all caste groups. Our specification is as follows:

$$S_{dmp} = \alpha + \gamma R_{dmp} + \beta_1 SHAREGP_{dmp} + \beta_2 SHAREMANDAL_{dm} + \beta_3 SHAREDIST_d + \varepsilon_{dmp} \quad (3)$$

Where S_{dmp} is our index of caste segregation, R_{dmp} is now a vector of length 4 containing all of the reservations dummies and $SHAREGP_{dmp}$, $SHAREMANDAL_{dm}$, and $SHAREDIST_d$ are vectors of length 3 containing elements for each caste group.

In all equations, errors are simultaneously clustered at both the mandal level and at the observation level across equations using seemingly unrelated estimation.

5.2 Estimating the Impact of Leaders' Party Affiliation

To estimate the impact of leaders' party affiliation on NREGA outcomes we employ a regression discontinuity approach by looking at MPTC races in which the ruling party just barely won or lost. Our goal is to estimate the causal effect of Congress party affiliation on NREGA outcomes for those constituencies in which the Congress and opposition are perfectly matched at the voting booths. Using the notation of the Rubin causal model, this figure may be written as

$$\tau_{overall} = E[Y_{dmp}(1) - Y_{dmp}(0) | MARGIN_{dmp} = 0] \quad (4)$$

where $Y_{dmp}(1)$ is our outcome of interest in a world in which the MPTC is from Congress, $Y_{dmp}(0)$ in a world in which the MPTC is not from Congress, and $MARGIN_{dmp}$ is the margin of victory or loss for the Congress candidate. The identifying assumption underlying this approach is that constituencies in which the Congress party barely won are, on average, similar to those constituencies in which Congress barely lost. If this assumption holds, our quantity of interest, $\tau_{overall}$, may be estimated using

$$\tau_{overall} = \lim_{margin \downarrow 0} E[Y_{dmp} | MARGIN_{dmp} = margin] - \lim_{margin \uparrow 0} E[Y_{dmp} | MARGIN_{dmp} = margin] \quad (5)$$

It is not possible to directly test our identifying assumption. Yet we may employ several indirect approaches to assess the overall credibility of our estimation strategy. First, we test for a discrete jump in the covariates at our cutoff point of an even election for the Congress candidate. Under the identifying assumption, all covariates should vary smoothly across this cutoff point and thus the presence of a discrete jump would strongly suggest that our assumption does not hold. Employing the same RD estimation strategy described below, we find no evidence of any such discrete jump in our covariates at the cutoff point. Second, we may compare the numbers of invalid votes, figures for which are also included in the dataset, in the set of MPTC races in which Congress barely won with those in which Congress barely lost. If officials or other Gram Panchayat leaders are able to manipulate the vote count to make sure that Congress candidates win (or lose) in extremely close races then our identifying assumption is likely invalidated. If true, MTPC constituencies in which Congress barely won will, on average, contain more officials capable and

willing to distort the outcome of elections. T tests comparing the share of votes declared invalid in MPTC races in which Congress barely won with the share of votes declared invalid in those races in which Congress barely lost reveal no statistically significant differences.

In addition to $\tau_{overall}$ we may also be interested in estimating the effect of party affiliation in those cases where the official one level up is from the same ruling party and in which this official is not from the same party. If these higher level officials play a role in determining the level of funds available to a Gram Panchayat for implementation of NREGA, then we would likely see an increase in NREGA participation due to the sarpanch being from Congress only in those instances where the higher official was also from the Congress party. For MPTC races, the relevant higher official is the Mandal Parishad President (MPP), and since the MPP is indirectly elected by MPTCs themselves he or she is likely to be from the Congress party if and only if Congress wins a majority of MPTCs in a mandal. We define these effects as $\tau_{C_{dm}=0}$ and $\tau_{C_{dm}=1}$ where C_{dm} is a dummy variable for whether or not a majority of MPTCs in the mandal are from Congress.

Following Imbens and Lemieux, we estimate $\tau_{overall}$, $\tau_{C_{dm}=0}$, and $\tau_{C_{dm}=1}$ using a semi-parametric approach based on local linear regression. The kernel and choice of bandwidth for the local linear regression is described in detail in Imbens and Kalyanaraman (2009).

6 Results

Tables 6, 7, and 8 present results from estimation of equations 1, 2, and 3. Reserving a sarpanch seat for a member of the BC community increases the official share of BCs among NREGA workers in the Gram Panchayat by just under 2 percentage points. Likewise, reserving a sarpanch seat for a member of the SC community increases the official share of SCs among NREGA workers in the Gram Panchayat by 2.4 percentage points. All other effects of reservations are statistically insignificant. That reserving a sarpanch seat for a SC or BC results in an increase in the share of that group participating in NREGA but that this is not the case when a sarpanch seat is reserved for a ST is slightly surprising. We speculate that it may be due to the fact that ST populations tend to be much more concentrated than SC or BC populations. Thus, Gram Panchayats in which the sarpanch seat is reserved for a ST typically have a very high proportion of STs. This may make it more difficult for the sarpanch to increase ST participation in NREGA by selectively discriminating against other caste groups since their participation is likely relatively low.

Figures 2, 3, and 4 display NREGA outcomes for those MPTC races in which the Congress candidate barely won or lost. Table 9 presents results from our regression discontinuity estimation of the effect of an MPTC being from the Congress party. Figures 2 and 3 clearly show that, if all mandals are included and not just those in which the MPP is likely from the Congress party, there is very little difference in average NREGA outcomes between those constituencies

in which the Congress candidate barely won and those in which the Congress candidate barely lost. This is further confirmed by the results from the more sophisticated analysis presented in table 9. If we restrict our analysis to only those mandals in which the MPP is likely from the Congress party, there is a noticeable (though slight) change in NREGA outcomes between Congress-won and Congress lost constituencies. This difference does not hold up to scrutiny under the more sophisticated analysis: the regression discontinuity analysis reveals that the difference is not statistically significant at the 10% level (though only barely).

7 Conclusion

Our analysis indicates that reserving a sarpanch seat to a SC or BC results in a slightly increase in the proportion of SCs or BCs respectively participating in NREGA. We find no effect at all of reservations of sarpanch seats for women or STs and no effect of any type of reservation on levels of caste or gender segregation at NREGA worksites, average NREGA days worked by members of the reserved group, or average NREGA wage for members of the reserved group. Likewise, we find no statistically significant effects of an MPTC being from the ruling Congress party on NREGA outcomes.

Given the extremely large sample size under consideration, the lack of noticeable results is striking, especially given earlier findings from Chattopadhyay and Duflo (2004), Pande (1999) and others which indicate the gender or caste of elected leaders can strongly influence policy outcomes. It seems likely that either NREGA in AP is, as proponents argue, less susceptible to problems of capture or that locally elected leaders have far less influence over administration of the program than specified in official documents.

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A Calculation of Segregation Indices

Our indices for caste and gender segregation of NREGA work attempt to measure the extent to which worksites within a Gram Panchayat are segregated based on caste or gender. We use totals wages paid to all members of each caste and gender as a proxy for that caste or genders' participation at a given worksite. In the words of Reardon (2002), the creator of the multi-group segregation index upon which our indices are based, the index may be thought of as the "as the disproportionality in the proportions [of total caste or gender wages] across [worksites] "in a Gram Panchayat. It should be noted that our segregation indices do not take into account the demographic distribution of different castes (or genders) in the general population within the Gram Panchayat but only the demographic distribution of those who participate in NREGA. As the purpose of the indices is to measure inter-worksite segregation and not to measure levels of discrimination the selection of participants, taking into account the overall distribution of castes or genders in the general population would needlessly complicated our analysis. (The effect of reservations on Gram Panchayat level discrimination is analyzed separately.) In addition, our indices do

not take into account segregation that occurs over time within a worksite (for instance, if workers of a certain caste are only allowed to work at a worksite on certain days) or, in the case of caste segregation, segregation based on caste categories other than the official categories reported in the data. The values of the caste and gender segregation indices for each Gram Panchayat are based on Reardon's (2002) Theil information index formula for multi-group segregation. This formula is given below.

$$S = \frac{1}{E} \sum_{c=1}^C \pi_m \sum_{w=1}^W \frac{t_w}{T} \left(\frac{\pi_{cw}}{\pi_c} \right) \ln \left(\frac{\pi_{cw}}{\pi_c} \right) \quad (6)$$

Subscript c indexes gender / caste. Subscript w indexes worksite. Other formula elements are defined below:

π_{cw} = proportion of work (as measured by wages) at NREGA worksite w performed by members of caste / gender c

C = total number of castes/genders present in the Gram Panchayat

W = total number of worksites present in the Gram Panchayat

T = total wages disbursed via NREGA in the Gram Panchayat

t_w = total amount of wages disbursed at worksite w

And E is defined as:

$$E = \sum_{c=1}^C \pi_c \ln \left(\frac{1}{\pi_c} \right) \quad (7)$$

Appendix B: Figures

Figure 1: Map of Andhra Pradesh Displaying Districts by Rollout Phase

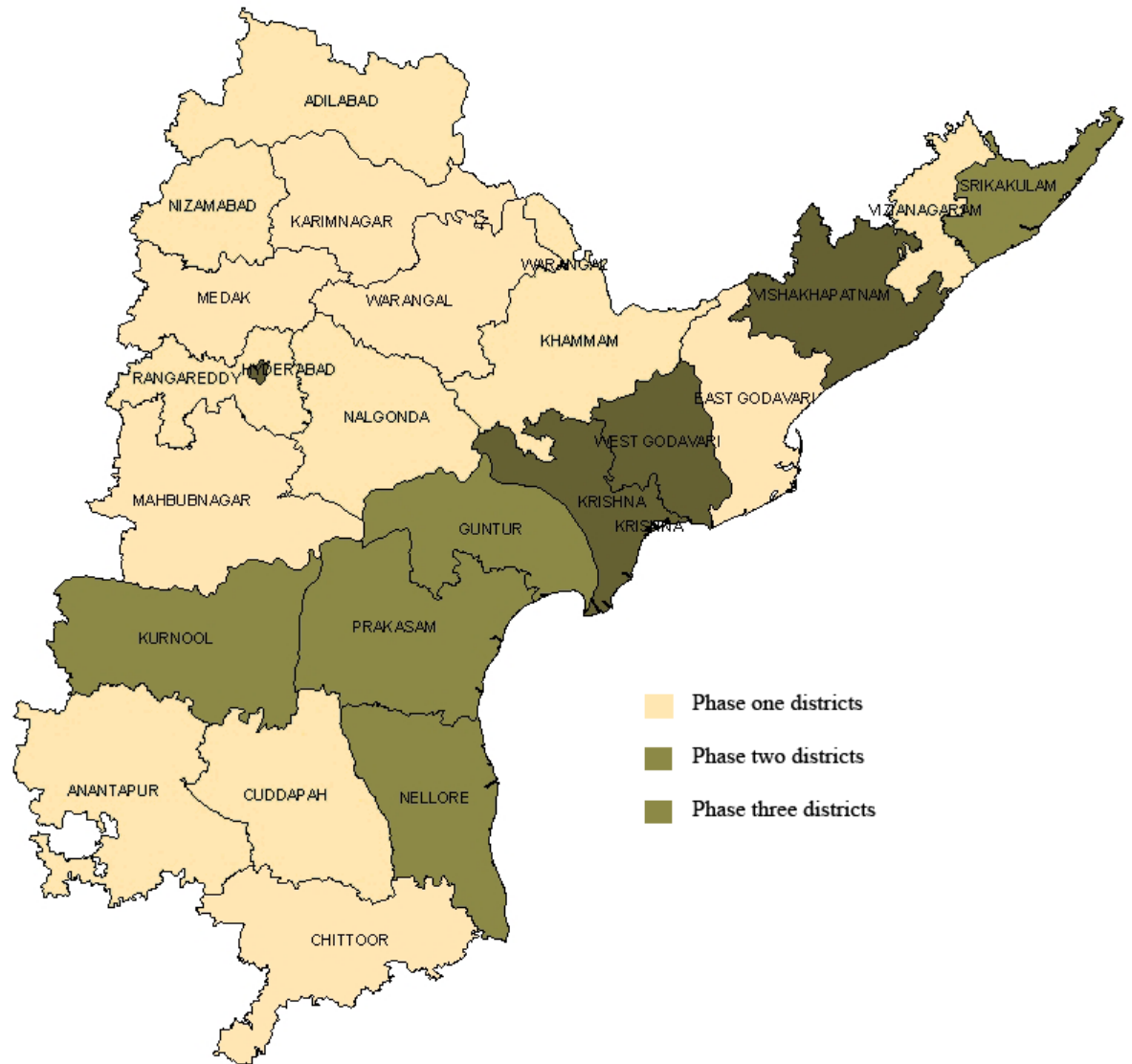
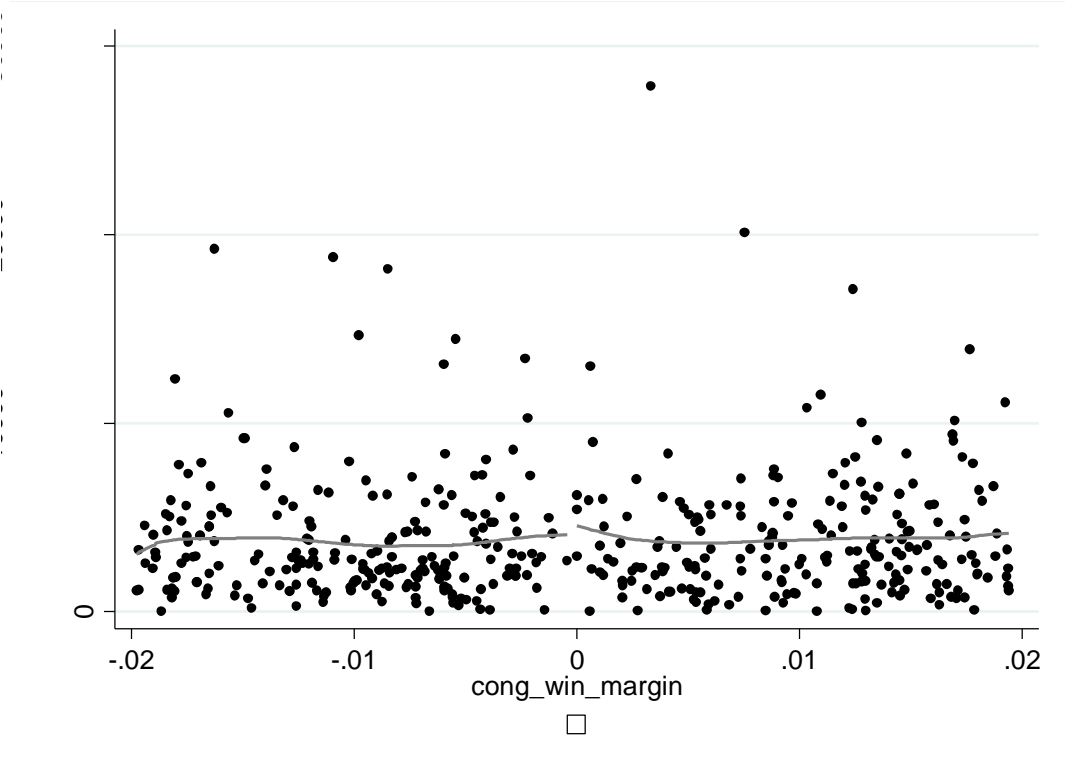
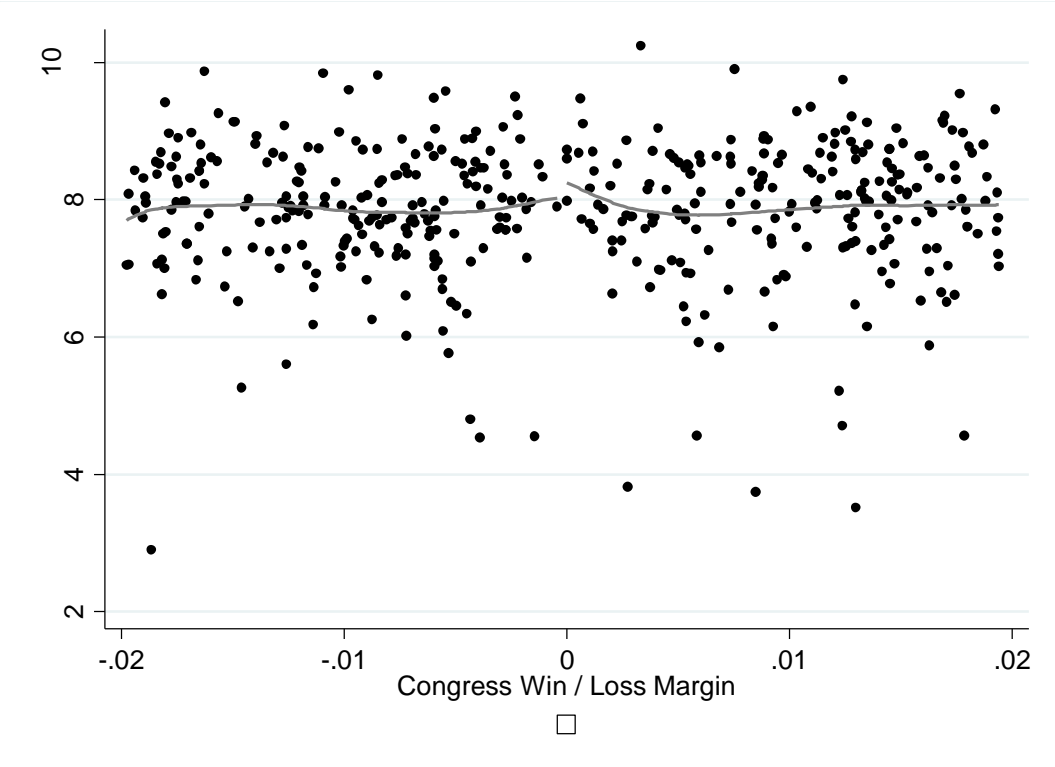


Figure 2: NREGA Wages per Capita vs. Congress Margin for Close MPTC Races



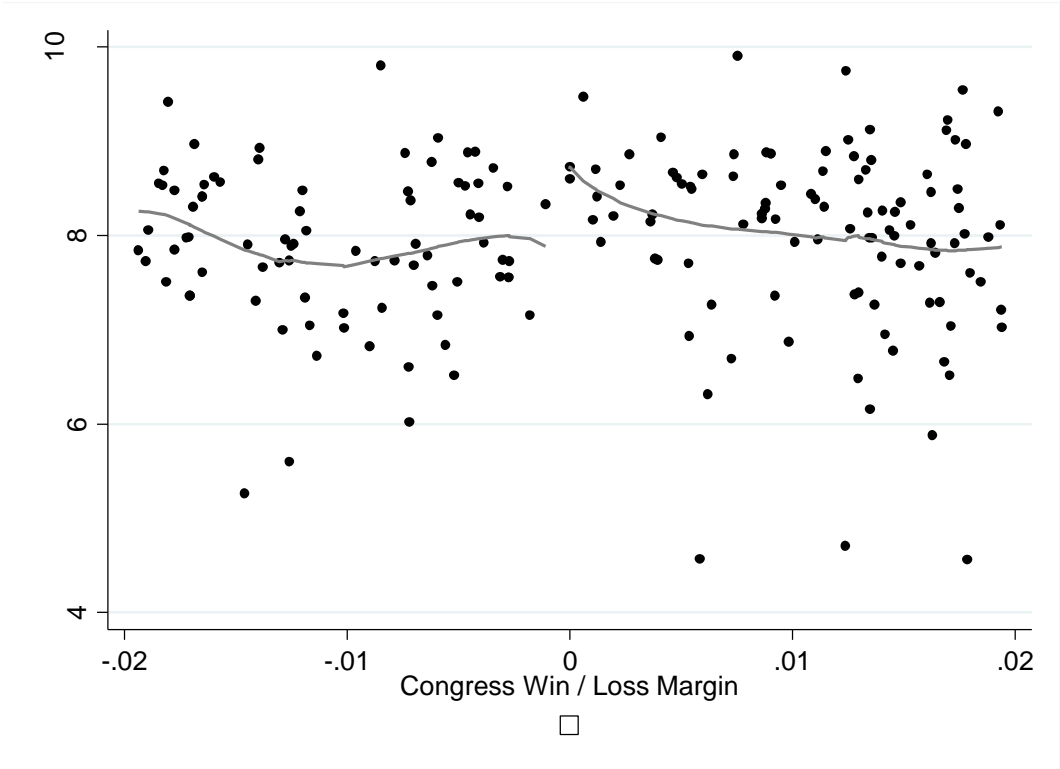
Notes: Fitted lines are local linear regressions including only observations left / right of cutoff point. Bandwidth for these local linear regressions has been chosen for ease of viewing and does not match the optimal bandwidth used for estimation purposes.

Figure 3: Log NREGA Wages per Capita vs. Congress Margin for Close MPTC Races



Notes: Fitted lines are local linear regressions including only observations left / right of cutoff point. Bandwidth for these local linear regressions has been chosen for ease of viewing and does not match the optimal bandwidth used for estimation purposes.

Figure 4: Log NREGA Wages per Capita vs. Congress Margin for Close MPTC Races in Congress Majority Mandals



Notes: Fitted lines are local linear regressions including only observations left / right of cutoff point. Bandwidth for these local linear regressions has been chosen for ease of viewing and does not match the optimal bandwidth used for estimation purposes.

Appendix C: Tables

Table 1: Selected State specific NREGA indicators for fiscal year 2008-09.

State	NREGA Employment (Person-days per rural household)	Share of women in NREGA employment (%)	Share of SC/ST in NREGA employment (%)	Share of unskilled labour in NREGA expenditures (%)	Avg. wage (Rs./day)
Mizoram	160.45	36.59	99.95	79.39	108.98
Manipur	97.36	45.92	74.56	62.16	72.62
Nagaland	77.5	36.71	100	54.37	80.77
Tripura	66.39	51.01	68.64	59.12	85.61
Rajasthan	63.37	67.11	52.03	67.4	88.31
Chattisgarh	38	47.43	57.73	61.78	73.2
Madhya Pradesh	36.69	43.28	64.63	57.55	73.17
Sikkim	29.05	37.66	49.85	58.25	92.88
Meghalaya	26.58	41.35	95.17	64.81	70.13
Andhra Pradesh	22.15	58.15	39.09	74.38	82.55
Jharkhand	20.03	28.51	58.01	48.46	90.45
Himachal Pradesh	18.86	39.02	41.3	57.2	99.07
Assam	18.06	27.16	44.86	57.67	77.13
Arunachal Pradesh	16.28	26.7	76.6	63.3	58.06
Tamil Nadu	14.7	79.67	62.01	95.55	79.68
Uttar Pradesh	11.25	18.04	55.5	60.13	99.62
Uttarakhand	8.83	36.86	32.3	63.19	84.64
Bihar	8.21	30.02	52.72	59	85.08
Jammu & Kashmir	7.29	5.76	35.89	44.04	67.54
West Bengal	7.13	26.53	52.26	62.76	78.21
Orrisa	6.22	37.02	56.32	60	89.15
Karnataka	4.38	50.42	41.64	69.58	80.99
Gujarat	3.98	42.82	63.23	72.7	67.8
Maharashtra	3.87	46.22	60.68	83.41	74.01
Kerala	3.13	85.01	28.73	80.14	120.06
Haryana	2.84	30.64	53.03	76.52	122.3
Punjab	1.46	24.63	74.28	57.65	111.32

Table 2: Selected Summary Statistics of NREGA Implementation in Andhra Pradesh

	Total Disbursed			Total Days Worked			Number Workers		
	Phase 1	Phase 2	Phase 3	Phase 1	Phase 2	Phase 3	Phase 1	Phase 2	Phase 3
FY0607	3,986,274,561	NA	NA	49,356,477	NA	NA	6,393,254	NA	NA
FY0708	10,211,970,096	2,818,590,243	NA	124,308,311	34,875,497	NA	15,011,592	4,313,332	NA
FY0809*	9,314,046,706	4,246,734,517	719,231,094	113,387,289	50,716,765	9,002,675	13,524,284	5,746,054	1,319,347

* Data from FY0809 only includes first 8 months of the fiscal year.

Table 3: Participation by Caste, Phase 1 Districts

	Total Rural Population	Share of population by group	Total Workdays by group	Share of total workdays by group	Total wages by group	Share of total wages by group
SC	5,530,281	18.0%	81,309,178	28.3%	6,666,683,982	28.3%
ST	3,061,316	10.0%	39,562,413	13.8%	3,230,619,231	13.7%
Other	22,049,550	72.0%	166,449,439	57.9%	13,634,631,333	57.9%
Total	30,641,147	100.0%	287,321,030	100.0%	23,531,934,546	100.0%

Notes: Rural population statistics gathered from 2001 national census village directory data. Only data from phase one districts has been included in this table as the caste demographics of districts in different phases differs and thus presenting overall statistics for the state as a whole would be misleading.

Table 4: Sarpanch Reservation Status and Demographic Variables

	BC	SC	ST
SHARE OF WARDS RESERVED FOR CASTE GROUP IN GP	0.134*** (0.0004)	0.129*** (0)	0.293*** (0)
SHARE OF SARPANCH SEATS RESERVED FOR CASTE IN MANDAL	0.899*** (0)	0.935*** (0)	0.770*** (0)
SHARE OF TOTAL WARDS IN DISTRICT RESERVED FOR CASTE GROUP	-0.025 (0.6093)	-0.073 (0.3146)	0.023 (0.3381)
CONSTANT	-0.002 (0.887)	0.001 (0.9536)	-0.006* (0.0339)

Notes: P-values in parentheses.

Table 5: Summary Statistics for Merged and Unmerged Gram Panchayats

Statistic	Unmerged - reservations	Merged	Unmerged - NREGA
N	7,734	14,074	7,034
Number of wards in GP	10.0840 (2.1064)	10.0080 (2.1022)	NA
% wards in GP reserved for BC	0.3333 (0.1477)	0.3336 (0.1708)	NA
% wards in GP reserved for SC	0.1956 (0.1420)	0.1905 (0.1365)	NA
% of wards in GP reserved for ST	0.0868 (0.2058)	0.1025 (0.2204)	NA
% NREGA workers women	NA	0.5142 (0.1227)	0.4981 (0.1301)
% NREGA workers BC	NA	0.4547 (0.2816)	0.4458 (0.2776)
% NREGA workers SC	NA	0.3094 (0.2433)	0.3139 (0.2440)
% NREGA workers ST	NA	0.1113 0.2307	0.0945 (0.2156)

Notes: Standard deviations in parentheses.

Table 6: NREGA Outcomes and Caste Reservation Status

	BC			SC			ST		
	Share of NREGA workers from caste	Average days work per caste member	Average wage for caste	Share of NREGA workers from caste	Average days work per caste member	Average wage for caste	Share of NREGA workers from caste	Average days work per caste member	Average wage for caste
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sarpanch reserved for caste dummy	0.019*** (0.0000)	0.235 (0.5042)	-0.011 (0.9533)	0.024*** (0.0000)	-0.423 (0.3248)	0.099 (0.6595)	-0.009 (0.1489)	0.199 (0.7882)	0.578 (0.2357)
% panchayat ward seats reserved for caste	0.996*** -	1.405 (0.6513)	2.868 (0.1986)	1.013*** -	0.321 (0.8801)	-2.763* (0.0287)	0.942*** -	-3.592 (0.0518)	-0.445 (0.7033)
% sarpanch seats reserved for caste in mandal	-0.144** (0.0054)	5.512 (0.2829)	-2.24 (0.5406)	0.403*** -	-7.991 (0.3987)	-10.017 (0.0927)	0.027 (0.1839)	-1.339 (0.6995)	4.797** (0.0099)
% ward seats reserved for caste in district	0.403*** -	14.667* (0.0500)	-3.405 (0.5211)	0.466*** -	-25.97 (0.1076)	28.960** (0.0080)	0.012 (0.6071)	27.279*** (0.0004)	-16.140*** (0.0006)
Constant	0.029* (0.0287)	23.859*** -	83.256*** -	-0.047*** -	40.078*** -	78.927*** -	0.011*** -	26.884*** -	82.753*** -

Notes: Errors clustered at mandal level and across equations. P-values in parentheses.

Table 7: NREGA Outcomes and Women's Reservation Status

	Gender Segregation	Share of NREGA workers women	Average days work women	Average wage for women
	(1)	(2)	(3)	(5)
Sarpanch reserved for woman dummy	-0.001 (0.6873)	0 (0.9493)	0.527 (0.0961)	-0.131 (0.4682)
Constant	0.103***	0.514***	32.380***	82.206***
	-	-	-	-

Notes: Errors clustered at mandal level and across equations. P-values in parentheses.

Table 8: Caste Segregation Index

	Caste Segregation Index
Sarpanch reserved for woman dummy	0.003 (0.1236)
Sarpanch reserved for BC dummy	-0.001 (0.6154)
Sarpanch reserved for SC dummy	0 (0.8916)
Sarpanch reserved for ST dummy	0.001 (0.8038)
% panchayat ward seats reserved for BC	0.027 (0.1555)
% sarpanch seats reserved for BC in mandal	-0.058* (0.0350)
% ward seats reserved for BC in district	-0.186*** (0.0000)
% panchayat ward seats reserved for SC	0.026* (0.0169)
% sarpanch seats reserved for SC in mandal	0.002 (0.9648)
% ward seats reserved for SC in district	-0.376*** (0.0000)
% panchayat ward seats reserved for ST	0.105*** -
% sarpanch seats reserved for ST in mandal	0.069** (0.0012)
% ward seats reserved for ST in district	-0.295*** -
Constant	0.269*** -

Notes: Errors clustered at mandal level and across equations. P-values in parentheses.

Table 9: Regression Discontinuity Estimates of Party Affiliation on Log NREGA Wages per Capita

	$\tau_{overall}$	$\tau_{C_{dm}=0}$	$\tau_{C_{dm}=1}$
Size	.1832 (.3069)	-.1158 (.3623)	.4022 (.2817)

Notes: Standard errors in parentheses.