Electoral Redistricting in the World's Largest Democracy: An Evaluation

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September 2009

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Abstract

We examine the recently completed electoral redistricting process in India, using detailed geographical and electoral data to construct new measures of the extent of redistricting in a given constituency. We find that the redistricting process achieved its main goal of equalizing constituency sizes to a substantial degree, and incumbent politicians were not able to influence the process to a great extent. Consistent with this, we do not find any significant effects of the extent of redistricting on the probability of a given incumbent to run for re-election, or their probability of winning. The redistricting process also made little change to the estimated seats-votes curves in state elections. Our results suggest that a politically neutral redistricting process can be implemented by a non-political body with a transparent and inclusive process.

1. Introduction

Most democratic countries undergo a process of redrawing their electoral boundaries every few years. India, the world's largest democracy, underwent this process in 2008 after a gap of three decades. Since this process has the potential of significantly altering political outcomes, it is important to understand whether the process was affected by partisan concerns, as well as to examine the consequences of this process for future political outcomes. We examine the patterns of electoral redistricting using detailed geographical and electoral data from two states in India.

This paper contributes to the literature on electoral redistricting in three significant ways. First, we examine the pattern of redistricting in detail, especially the relationship of redistricting patterns with pre-existing demographic and political characteristics. This is in contrast to most of the literature in the US or other advanced democracies, which take the process of redistricting to be given and examine its consequences in future elections. Conclusions about the pattern of redistricting are based primarily on ex-post outcomes rather than ex-ante analysis. Second, in order to conduct this ex-ante analysis, we construct new measures of the extent of redistricting in each constituency. Again, this is in contrast with the existing literature which focuses primarily on constructing seats-votes curves for the entire state or country, rather than examine constituency-level changes in any detail. The measures we compute are based on close comparison of the old and new constituencies using GIS mapping, and can be easily generalized to other settings. Third, to our knowledge, this is the first paper which examines the process and consequences of electoral redistricting in a developing country, where one might expect voter information and accountability mechanisms to be less widespread than in an advanced industrial democracy.

We find that the redistricting process in India largely achieved its primary goal of equalizing constituency sizes within states. Constituencies which were too large or too small relative to the district average undergo a greater extent of redistricting, as measured by changes in population, demography or expected voting behavior. Political factors play a less important role in determining the extent of redistricting, though we observe that the constituencies of incumbent politicians who were involved with the process are less likely to show major changes.

How did the process of redistricting affect political outcomes? We do not find any significant relationship between the extent of electoral redistricting and the propensity of incumbents to run for re-election; however, if a politician's constituency became subject to

reservation for disadvantaged groups, then s/he is significantly less likely to run for re-election after redistricting. For non-incumbents, their performance in the previous election was the major factor in deciding whether they would run again. Previous studies have documented a significant degree of anti-incumbency bias in Indian elections.[1] We do not find any significant associations between the extent of redistricting and the probability of an incumbent politician or party getting re-elected. We examined some indicators of political competition, such as the number of candidates running for each seat and the average vote share margin of the winning candidate. We find that fewer candidates enter the race when the constituency becomes reserved for Scheduled Castes, and incumbent parties are more likely to retain control of these seats, possibly because they are able to field alternate candidates belonging to the right social group and benefit from the reduced competition.[2]

In keeping with the previous literature, we also estimated seats-votes curves for these states based on the methodology developed by Gelman and King (1994a).[3] We find that the levels of partisan bias were much lower in Indian states, compared to the United States where most states display a relatively higher level of partisan bias. This is consistent with the fact that redistricting in India has always been done by a non-political commission. The responsiveness of the seats-votes curve is around 2.7, far above the value of 1 we would expect in a proportional representation system, but similar to the values estimated for other first-past-the-post systems such as the United States. To the best of our knowledge, this is the first time such indices have been computed for the Indian political system.

We find that the redistricting process led to very little change in the seats-votes curves, in terms of either the partisan bias or the responsiveness parameters. This is consistent with our

[1] Incumbent candidates who won by a narrow margin are significantly more likely to lose elections in both national elections (Linden, 2004), and state legislative elections (Uppal, 2009). Such an anti-incumbency effect is however not detected for incumbent parties (Barooah, 2006), though Ravishankar demonstrates that incumbents from ruling parties are more likely to lose elections after controlling for a "honeymoon" period (Ravishankar, 2009).

[2] The Constitution of India provides for political reservations for certain historically disadvantaged groups: Scheduled Castes and Scheduled Tribes. In such reserved constituencies, only members of these communities can contest elections. Scheduled Castes refers to communities which were traditionally at the bottom of the Hindu caste hierarchy, while Scheduled Tribes have been largely outside the Hindu caste system. There are several other affirmative action programs for these groups, such as reservations for members of these groups in government employment and educational institutions. Research by Pande (2003) and Krishnan (2007) shows that such mandated reservations do increase minority influence on policy. In particular, having an additional SC legislator significantly increases spending on SC and ST welfare programs, and leads to greater provision of schools and health centers in the areas where SCs live. The impact of an additional ST legislator is, however, very small.

[3] This has been applied to numerous elections in the United States, most recently to analyze the 2006 and 2008 elections (Kastellec, Gelman and Chandler, 2008a, 2008b).

previous results that redistricting did not make much difference to incumbent politicians' propensity to run for re-election, and suggests the redistricting process in India was politically neutral to a great degree. The most likely reasons for this are that the process was conducted by an explicitly non-political commission, there was a very high level of transparency throughout, and extensive efforts to involve political parties and voters to give their inputs to the process. As a result, there has been relatively little controversy over the process as a whole.

The rest of the paper is structured as follows: Section 2 describes the process of electoral redistricting in India and Section 3 discussed our key testable hypotheses. Section 4 describes how we construct our measures of the extent of redistricting, and Section 5 analyzes the determinants of the extent of redistricting. Section 6 discusses political outcomes in the post-redistricting period and Section 7 concludes.

2. Redelimitation of Electoral Constituencies in India

India is a parliamentary democracy with elections being held to national and state legislature every five years. Elections are held on a first-past-the-post basis in explicitly demarcated electoral constituencies. As in many other democracies, electoral redistricting (or "redelimitation" as the process is known in India) was initially undertaken after each decennial census.[4] However, this process was halted in 1977, after complaints from several states that the process undermined the incentives of states to implement population control policies, since a bigger population would result in more state representatives to the national parliament. A law was passed which specified that all electoral boundaries as of 1977 would be frozen in place until after the 2001 census.

In 2002, India began the process of redrawing of electoral constituencies based on the census of 2001.[5] In response to the earlier concerns about distorting incentives for state governments, the current redelimitation exercise specified that the total number of electoral constituencies would remain the same, both for the national legislature as well as for state legislatures. Further, each state would continue to have the same number of representatives in the national legislature i.e. there would be no reallocation of seats across states. The goals of this

[4] We will use the terms "redistricting" and "redelimitation" interchangeably in this paper.

[5] The process was officially begun by the enactment of the Delimitation Act, 2002 and the Delimitation (Amendment) Act 2003. These Acts were in turn made possible by the Constitution (Eighty-fourth Amendment) Act, 2001 and the Constitution (Eighty-seventh Amendment) Act, 2003 which, inter alia, amended Articles 81, 82, 170, 330 and 332 of the Constitution of India.

redistricting exercise were therefore two-fold: first, to equalize the population across electoral districts *within* each state, and second, to re-demarcate the electoral constituencies to be reserved for the Scheduled Castes (SC) and the Scheduled Tribes (ST) in proportion to their increased population share. Such reservation or affirmative action for these disadvantaged sections of society had been in place since the Constitution was adopted in 1950. Only members of the specific communities were eligible to contest elections in such reserved constituencies.

Since this was the first redrawing of electoral boundaries in three decades, this resulted in widespread changes to the electoral boundaries. Rural-urban migration has resulted in much faster growth of urban population compared to rural population; the redistricting exercise therefore resulted in a greater allocation of electoral seats to urban areas. For instance, in the state of Andhra Pradesh, Hyderabad city and its surrounding areas were represented by 19 seats until 2008, but will be represented by 29 legislators from 2009 onwards.[6] The population of this predominantly urban area increased by 30% between 1991 and 2001, while the population of the state overall increased only by 14.5%.

The redistricting exercise in India was carried out by an independent (non-political) three-member Delimitation Commission, comprised of a former Supreme Court judge, the Chief Election Commissioner of India and the State Election Commissioner of the state concerned.[7] Ten elected representatives from the state (five from the state legislature and five from the national parliament) acted as "associate members" to advise the Delimitation Commission, though they had no voting power on the final decisions of the Commission. After examining data from the 2001 census and local maps, consulting with district officials, and meeting with these associate members, the Delimitation Commission prepared a detailed draft proposal with the proposed boundaries of each electoral constituency. This draft proposal was widely published, public comments are invited, and public sittings in one or more places were held to hear the view of the public. Political parties in the state scrutinized these proposals and submitted their views for consideration, often proposing new boundaries for certain constituencies. After taking all these views into account, final reports were published for each state, all of which were approved by the President of India in August 2008, and came into effect in subsequent elections. By law,

[6] Districts of Hyderabad and Rangareddy.
[7] The Election Commissions at national and state level are staffed by career bureaucrats, who are required to be politically neutral.

these electoral boundaries cannot be changed until the first census after the year 2026. Given the decennial census schedule, these boundaries will be in place till 2031 at least.

The explicit goal of the Delimitation Commission was to redraw constituencies such that "the population of each parliamentary and assembly constituency in a State shall, so far as practicable, be the same throughout the State." This was subject to the constraints that the constituencies be geographically compact and contiguous, every state assembly constituency should lie wholly within a national parliamentary constituency, and all assembly constituencies should lie wholly within administrative districts. Factors such as physical features, facilities of communication and public convenience are also to be considered, such that areas divided by rivers or hilly ranges or forests or ravines and other such natural barriers were not be put in the same constituency. This consideration is mainly related to the logistics of conducting elections within the constituency. Since these constraints make the exact equalization of population across constituencies difficult, the Delimitation Commission agreed that the population in a specific constituency could vary up to 10 percent above or below the district average.

After these constituencies are mapped out, constituencies which are to be reserved for the Scheduled Castes (SCs) and Scheduled Tribes (STs) are demarcated. The overall number of constituencies to be reserved for the SCs and STs are based on their population share in the state, and the exact constituencies chosen for reservation are the ones which have the largest population shares of these communities. For Andhra Pradesh, the number of constituencies reserved for SCs increased from 39 to 48, and the number reserved for STs increased from 15 to 19. For Rajasthan, there was an increase of one reserved seat each for SCs and STs.

We see that the redistricting exercise significantly equalized the population sizes of the different electoral constituencies, fulfilling the primary goal of the exercise. Figures 1 and 2 show that there was a high degree of variation in constituency population sizes before the redistricting exercise, while the variation is much less after the redistricting exercise takes place. The distribution of other characteristics, such as the extent of urbanization, the average literacy, or the proportion of disadvantaged minorities, does not show such stark differences before and after the redistricting exercise, though we do see a slight increase in the fraction of urban-majority constituencies. This relative stability in the distribution of demographics is most likely a consequence of the fact that the redrawing of boundaries was largely a local exercise, with

contiguity being one of the required properties. This does not rule out potentially large changes in specific constituencies.

3. Incumbent Politicians and Electoral Redistricting

3.1 What Determines the Extent of Redistricting?

We begin by considering the question of what determines the extent to which a constituency is changed by the redistricting process. Given that all constituencies in Rajasthan and nearly 90% of the constituencies in Andhra Pradesh underwent some change in their boundaries, our first challenge is to measure the extent to which the constituency was changed. Such measures of constituency-level boundary change, as far as we know, have not been computed for other instances of redistricting. We construct four different measures of whether a constituency is changed, based on (i) movements of population into and out of constituencies (ii) extent of demographic changes between the old and new constituencies (iii) expected change in the ruling party's vote share as a result of the redistricting and (iv) expected change in the extent of political competition. The construction of these measures is described in detail in Section 4.1.

In this section, we consider the factors which might influence the extent to which a constituency is redistricted. The official procedures and goals of the program suggest that constituencies whose population was extremely small or extremely large with respect to the district average are the most likely to have been changed by the redistricting process. Therefore, our first variable to consider is the difference between the constituency size and the district average mandated by the Delimitation Commission. Since very small or very large constituencies are more likely to be redistricted, this implies that we should observe a U-shaped relationship between the extent of redistricting and initial population size of the constituency.

Political considerations can also determine the pattern of redistricting, in particular the desire of the party in power to maximize their seat share in future elections. Friedman and Holden (2008) model such a process of redistricting in which a party seeks to maximize the total number of seats it wins in a first-past-the-post system. They find that the optimal scheme (from the party's point of view) would create constituencies which the party can win by the smallest possible margin. In such a scheme, the voters most likely to vote for the party are grouped with those most likely to vote for the opposition (i.e. matching from the extreme ends of the voting distribution), in such a way that the extreme supporters just outnumber the extreme non-

supporters. A consequence of this in our setting means that constituencies where the incumbent party candidate won by a small margin are least likely to be redistricted, while those where they either won or lost by large margins are more likely to be redistricted. We check this hypothesis by looking at the vote shares of the incumbent party in the election(s) prior to the redistricting process. In particular, this is most likely to hold for a measure of redistricting based on expected changes to the vote share of the incumbent party (the "votes" measure).

A third potential consideration is that even if the party is unable to achieve its optimal redistricting scheme, individual politicians might be able to exert influence on the redistricting process. In particular, we would be most interested in whether politicians who are members of the Advisory Committee are able to prevent unfavorable redistricting of their constituency and/or achieve a more favorable redistricting.

3.2 The Impact of Redistricting on Politician Outcomes

How does redistricting affect the outcome for politicians? The literature so far has focused almost exclusively on estimating seats-votes curves in periods before and after electoral redistricting. Gelman and King (1994a) pioneered an approach by which the seats-votes curve (the expected relationship between the vote share and the seat share obtained by a party) could be estimated using data from a single election, under certain assumptions, including that of two-party competition. They investigated two properties of these seat-votes curves: the partisan bias and the responsiveness. The major conclusion from the US has been that partisan bias declines following a redistricting exercise, while the responsiveness typically increases. Whether this represents a move towards the optimal seats-votes curve is more debatable: Coate and Knight (2008) find that existing districting patterns are close to optimal and in fact, are overly responsive.

There has been a lot of concern in the United States about the redistricting process being misused to create "safe" seats, where incumbents are unlikely to face strong electoral challenges ("gerrymandering"). However, Friedman and Holden (2009) find that partisan gerrymandering is not a significant determinant of the increasing re-election probability of US politicians. The economics literature has also focused on the consequences of redistricting for public policy outcomes (Besley and Preston, 2007; Baqir, 2002).

We will consider whether incumbents' decisions to run for re-election are significantly changed due to the redistricting process, and whether the redistricting process helped certain parties to retain power more easily. We will use both our measures of the extent of redistricting, as well as the seats-votes curve estimation methodology of Gelman and King (1994a) to see whether the redistricting process leads to a change in political outcomes.

4. Data and Empirical Strategy

4.1 Data

The analysis in the current paper is for the states of Andhra Pradesh and Rajasthan. These states were chosen for two main reasons. The first was the availability of GIS data and maps required to match up the boundaries of the old and new electoral constituencies, so as to enable us to construct numerical measures of the extent of redistricting. Second, these states exhibit variation on several different political dimensions. They are on different electoral calendars: Rajasthan held its first post-delimitation elections for the state legislative assembly in December 2008, while Andhra Pradesh had its first post-delimitation state election in April 2009, coinciding with elections for the national parliament. The incumbent party during the redistricting process was the Indian National Congress (INC) in Andhra Pradesh and the Bharatiya Janata Party (BJP) in Rajasthan. Finally, both these states feature electoral competition between two large parties, with third parties playing only a small role, leading to ease of analysis.

We gathered information on the geographical boundaries of the different state electoral constituencies using information in the Delimitation Commission Reports of 2008 and 1976, followed by matching up the old and new constituencies using GIS maps and maps provided on state government web sites. These old and new boundaries were then matched up to village-level census data so that we could compute demographic characteristics of the old and new constituencies. As mentioned before, the urban population growth has outstripped rural population growth in both these states, and the number of constituencies assigned to large cities has increased considerably. However, we were not able to match the changes in electoral constituency boundaries within cities, since the number and boundaries of wards within cities has changed considerably across time.[8] This means that we are able to compute the extent of

[8]The exception is Hyderabad, where we were able to obtain detailed maps of old and new constituencies from the Andhra Pradesh state government website.

redistricting for 285 constituencies out of 294 in Andhra Pradesh, and 184 out of 200 constituencies in Rajasthan.

In terms of political variables, we collected data on the candidates' decision to run for re-election for the first post-delimitation election, as well as two pre-delimitation elections for each state. By manually checking the names of candidates against the list of competing candidates in the next election, we created a dummy which equals one if the candidate decides to run for election in the following election cycle. We also kept track of who won each election. We have information on the party affiliation and the gender of each candidate, and the number of votes obtained by them, as well as constituency-level variables such as electoral turnout and the total number of candidates.

We should note that all these elections are in the post-1989 period. The year 1989 marked a significant change in India's electoral landscape: the Congress party was no longer the dominant national party after this election, and the 1990s have been characterized by a significant degree of anti-incumbent bias in the sense that incumbents are more likely to lose the next election than non-incumbents (Linden, 2004; Ravishankar, 2009; Uppal, 2009). In addition to focusing on incumbents' decision to compete, our analysis can also shed light on whether this anti-incumbency bias is likely to change following the widespread redrawing of electoral boundaries, and how this is likely to be attenuated or exacerbated by the changes in incumbents' electoral strategies. An interesting recent trend is for state governments in India to get re-elected (often against prior predictions), in contrast to the long period of strong anti-incumbency during the 1990s and the 2000s.[9] While many observers attribute this to a growing tendency to reward good performance, we attempt to see whether redistricting contributes to this trend as well.

4.2 Measuring the Extent of Redistricting

The vast majority of state electoral constituencies underwent boundary changes to a larger or smaller extent during the Indian redistricting process. We see wide variations in the extent of boundary changes even within a single district. For instance, Figure A.1 shows the old and new maps of Adilabad district in Andhra Pradesh. We see that constituency #239 remained the same (renumbered as #10), constituencies #245 and #247 were reduced in size, while parts of

[9] Examples include the INC retaining power in Delhi for the third time in December 2008, the INC getting re-elected in Andhra Pradesh and the Biju Janata Dal (BJD) winning the elections in Orissa for the third straight time.

constituency #241 were distributed across three new constituencies (#5, #6, and #8). To be able to distinguish the effect of redistricting, we therefore seek to measure the extent to which the constituency was changed during this process.

The first measure we use is based on looking at the extent to which the constituency was split up, or the different pieces which were added to the constituency. For instance, parts of constituency #246 went to two new constituencies, but only 8.6% of the population went to another constituency, while the remaining 91.4% of the population stayed together. This obviously presents less of a challenge to a candidate than the situation for constituency #242, which also got split into two, but with population proportions of 21% and 79%. To capture this difference, we use a Herfindahl index of the population shares of the old constituency going to different new constituencies.[10] Similarly, many constituencies had pieces added on to them: for instance, new constituency #5 was constructed from the old #244 by dropping some areas (which went to #3), but also adding some areas from erstwhile constituencies #241 and #243. We construct a similar Herfindahl index of the population shares of the new constituency which have come from different old constituencies. The final *population-based measure* of the extent of redistricting is computed as the sum of these two measures.

While the population based measure might capture the extent of any change in the population distribution, it may not capture the politically relevant dimensions. Politicians may not care about absolute population changes as long as the characteristics of the voters remain the same as before. We therefore calculate an index of the demographic changes induced by the redistricting process. From the census of 2001, we know certain characteristics at village level: the extent of urbanization, the male-female ratio, the literacy rate and the proportion of disadvantaged minorities (Scheduled Castes and Scheduled Tribes). We compute the index as $\Sigma_j (X_{j,old} - X_{j,new})^2$, where $X_{j,old}$ represents the demographic characteristic j (urbanization, literacy etc) for the old constituency, and $X_{j,new}$ represents the same for the new one. Since all the characteristics are between 0 and 1, the theoretical maximum value of this index is 5. In practice, this almost never attains values above 0.25 (Table 1). More importantly, this measure is only moderately correlated with the population-based measure (correlation=0.24), suggesting that this indeed captures a different dimension of change (Table 2).

[10] Formally, we compute $1 - \Sigma^k_{i=1} s_i^2$, where s_i is the share of the old constituency's population going to new constituency I, and k is the number of new constituencies which have some population from the old constituency.

Finally, we compute two measures of the extent of redelimitation based on political variables from prior elections. The first measure is simply the difference in the vote share of the incumbent party in the old constituency and the likely vote share in the new constituency. The vote share in the new constituency is calculated as the weighted average of the vote shares for the incumbent in the various pieces the new constituency is made up of. Obviously, for constituencies which had no boundary changes, or which only shrank in size, there is no change in the expected vote share.[11] The theoretical maximum for this variable is 1, and the maximum attained in the data is about 0.37. The second political measure is the expected change in the degree of political participation and competition, which is computed as an index similar to the demographic change index above. The variables used in this computation are the voter turnout, the number of candidates and the vote margin of the winning candidate in the previous election. Similar to the expected vote share difference, this measure will equal zero for constituencies which either remained unchanged or shrank in size. The theoretical maximum for this index is 3, but the maximum attained in the data is only 0.1 (Table 1). These voting-based measures are significantly correlated with the earlier population-based and demographic measures of redistricting (Table 2), consistent with the idea that changes in population characteristics would lead to changes in political behavior. But they are very far from being completely determined by them (all correlations are less than 0.50).

4.3 Empirical Specifications

In the first part of the paper, we examine the factors which influence the extent of redistricting by running regressions of the form:

$$ExtentRedistrict_j = constant + b'X_j + e_j \qquad (1)$$

where $ExtentRedistrict_j$ will be one of our measures of the extent of redistricting for constituency j, and X_j includes the demographic and political characteristics discussed in Section 3.1.

In the second part of the paper, we focus on whether redelimitation changes political outcomes by running the following regression for candidate i in constituency j and election t:

[11] The underlying assumption here is that all parts of the constituency are likely to vote for the incumbent to the same degree. In future work, we plan to refine this measure using data from local elections to estimate probable vote shares in subsections of the constituency.

$$PolOutcome_{ij} = Constant + bExtentRedistrict_j + cZ_j + dCandidateChars_{ij} + e_{ij} \qquad (2)$$

where $PolOutcome_{ij}$ is the political outcome in the post-redistricting election. We consider two major outcomes: whether an incumbent politician chooses to contest the election, and whether he wins the election. Z_j contains some of the demographic and political variables which significantly affect the extent of redistricting, as identified in (1) above. $CandidateChars_{ijt}$ controls for characteristics of the candidates themselves (gender, whether they belong to the ruling party, winning margin in the previous election, whether they won the election) and e_{ij} is an error term.

We will run this regression separately for candidates who won the last election (sitting incumbents) and for candidates who lose the previous elections. We can also combine all the candidates and examine whether electoral redistricting has a different effect on incumbents compared with non-incumbents.

5 What Determines the Extent of Redistricting?

We find that the discrepancy between the population of the constituency and the average mandated under the redistricting rules is a significant predictor of the population-based and demographic measures of redistricting (Table 3, Columns 1 and 4). This relationship remains significant even after controlling for demographic characteristics (Columns 2 and 5). Consistent with the fact that there has been much faster growth in urban rather than rural areas, we find that rural constituencies are more likely to undergo redistricting. The vote share of the incumbent party is not significantly related to the extent of redistricting, suggesting that political partisanship did not affect the extent of redistricting, at least as captured in these measures (Columns 3 and 6). However, membership in the advisory committee is associated with a significantly lower degree of demographic changes to the electoral constituency of the politician in question. Other political variables such as the number of candidates in the last election, the voter turnout and the victory margin of the winning candidate, were not significantly related to the population-based or demographic measures of redistricting (results available upon request).

The results are similar when we examine the potential extent of change in voting behavior. As before, the discrepancy between constituency population and the mandated average

is a strong predictor of the expected change in the incumbent party's vote share, as well as the index of the expected change in political competition (Table 4, Columns 1 and 4). Rural areas are more likely experience redistricting. We see some evidence of political partisanship here: the expected change in the incumbent party's vote share shows a significant quadratic relationship with the vote share in the previous election i.e. the pattern of redistricting is most likely to affect the places where the incumbent party's vote share was particularly low or particularly high (Table 4, Column 3). This is consistent with the Friedman and Holden (2008) framework of optimal partisan redistricting, where the incumbent party would be least likely to change the composition of constituencies where they hold a narrow majority. As before, measures of voter turnout or political competition are not significant predictors of this voting measure of redistricting (results available upon request).

The fourth measure of the extent of redistricting, an index of the potential change in political competition, also exhibits a strong relationship with the population deviation measure, and is higher for rural areas but is significantly lower for the constituencies whose politicians were members of the advisory committee (Table 4, Columns 4-6).

We should note that the main demographic driver of these measures of redistricting—the difference between constituency population size and the mandated district average (the "population deviation" measure)—is not a significant predictor of voting trends in prior elections (Appendix Table 1). This makes us more confident that what we capture in our measures of redistricting are not reflections of some prior political trends. We also checked the robustness of our results when we include the population size of the constituency rather than its deviation from the district average. As expected, we see a U-shaped relationship with population size: the most populous and least populous constituencies are likely to experience more changes in the redistricting process (Appendix Table 2). Finally, we check that these trends are fairly similar across both states, rather than being driven by only one state (results not shown).

Overall, we find that the redistricting exercise achieved its main objective of substantially equalizing the population sizes across different constituencies. Extremely large or extremely small constituencies are likely to experience the greater amount of redistricting. There is little evidence that incumbent parties were able to influence the redistricting procedure, but individual committee members might have been able to prevent their constituencies from becoming more

competitive. In the next section, we examine how politician outcomes were altered as a result of this redistricting exercise.

6 Politician Outcomes after Electoral Redistricting

6.1 Does the Incumbent Run for Re-election?

We see a significant decline in the probability of incumbents choosing to run for re-election after the redelimitation process. In the two elections prior to the redistricting process, about 71% of sitting MLAs (incumbents) ran for re-election. This fraction declined to 65% in the post-redistricting election (Figure 3). We see a similar decline in the propensity to contest the next election for politicians who were the runners-up in the previous election (44% versus 40%). In contrast, the probability of contesting increased substantially after redistricting for more marginal candidates.[12]

Is the decision of the incumbent politician to run for re-election systematically related to the extent to which his constituency got redistricted? Despite the observed decline in incumbents competing, we do not find a systematic link between the extent of redistricting of a constituency and the incumbent's decision to run for re-election. Table 5 shows the results from regression specification (2) for various measures of redistricting. None of the measures of redistricting are statistically significant predictors of the likelihood of running for re-election for either incumbents or non-incumbents. The effect of other variables are as expected: incumbents are significantly less likely to run for re-election if their new constituency turns out to be reserved for Scheduled Castes (as part of India's political reservations scheme); non-incumbents are significantly more likely to run again if they lost by smaller margins in the earlier election.

We did several robustness checks for this basic result that politicians' decision to run for re-election does not depend systematically on the pattern of redistricting, beyond the inability to run in reserved constituencies.[13] All the results are very similar if we use a logit specification instead of a linear probability model. The results remain unchanged if we use a difference-in-difference specification with constituency fixed effects, which enables us to control for pre-

[12] This difference between incumbents and non-incumbents rules out the possibility that the decline for incumbents occurred because of some data errors, or problems identifying where the incumbent was contesting from after redelimitation. In fact, in the post-delimitation period, we coded *ContestNextElec* to be one if the incumbent was contesting from any constituency in the district, compared to earlier periods where we coded this to be one only if the incumbent contested from the same constituency as before.

[13] These robustness checks are not shown in the interest of space, and are available from the authors upon request.

existing trends in running for re-election in that constituency. Since some districts lose constituencies during the redistricting process, but this numerical constraint is also not a significant predictor of incumbents' re-election possibilities.

Which politicians are more likely to be affected by the redistricting process? A plausible hypothesis is that the impact of redistricting is likely to be highest on incumbents who won by a smaller margin. We tested this explicitly by including the interaction of the extent of redistricting with the vote share margin of the politician in the previous election. We also tested whether incumbents from the ruling party react differently to the extent of redistricting. None of these interactions was statistically significant, for any measure of redistricting (results available upon request). Politicians who were on the advisory committee were not significantly more likely to run again, despite the fact that the extent of redistricting in their constituency appears to have been slightly smaller on average.

What then explains the decline in the fraction of incumbents who run for re-election? One factor which might have played a role is the shifting electoral alliances among parties. For instance, in Andhra Pradesh state, the Congress contested the 2004 elections in alliance with the TRS party, but the TRS chose to ally with the TDP in the 2009 elections. Since an alliance means that only one of the allying parties would put up a candidate in a specific constituency, incumbent politicians can lose their chance to compete due to these higher-level negotiations between leaders of different parties.

If alliance politics is a significant determinant of who gets the party ticket, we expect that politicians from smaller parties are more likely to suffer since the negotiating power of their parties might be relatively less in any alliance. We test this formally by running specification (2) for politicians belonging to the Indian National Congress, the main opposition party (BJP in Rajasthan and TDP in Andhra Pradesh), and third parties. We find some support for this hypothesis: politicians from minor parties are less likely to compete after redistricting is implemented (Table 6). The coefficient for these parties is consistently negative, and significant for the population-based measure, while the coefficients for the Congress or the major opposition parties do not show any consistent relationship with the extent of redistricting. We see other important differences between major and minor parties: major party candidates are significantly less likely to compete if the constituency becomes reserved for Scheduled Castes, while third parties are more likely to contest if the constituency becomes reserved for Scheduled Tribes.

This is consistent with the Indian setting, where many minor parties are active in areas with large tribal populations.[14]

Similar to the lack of systematic relationship with the decision to run for re-election, we also do not find any significant relationship between the probability of an incumbent politician getting re-elected and the extent of redistricting (Table 7). Overall our results suggest that beyond the sheer inability to contest in reserved constituencies, the redistricting process did not make much difference to incumbents' prospects for contesting again or getting re-elected. Higher level party decisions, such as seat-sharing arrangements with alliance partners, or other considerations of politician quality, appear to have played a bigger role. This is reflected in politicians' statements as well. For instance, the Andhra Pradesh Chief Minister denied party tickets to 48 incumbents, but said that, "About 10 to 15 [incumbent politicians] could not get the ticket because of the scrapping of their constituencies or change in the reserved status due to the delimitation. Others were denied the ticket because in party's perception their popularity ratings had gone down."

6.2 Does the Incumbent Party Win Re-election?

Even if the individual politicians' strategies are not changed to a great extent by redistricting, it could still be the case that the outcomes for the political parties as a whole might be significantly affected. One obvious way to examine this might be to look at changes in the type of candidates fielded by the party after redistricting. Unfortunately, we lack data on characteristics such as policy platforms espoused by the different candidates, because candidates typically stick to the official party manifesto. Measures of politician ideology, such as those constructed for the US using roll-call voting records, are also not available for India. For now, we therefore limit ourselves to examining whether parties are more likely to retain their political positions in the post-redistricting period.

As with individual politician outcomes, we do not find any evidence that incumbent political parties are significantly more likely to win re-election from constituencies which underwent a greater or lesser extent of redelimitation (Table 8, Columns 1 and 4). We do see that political parties are more likely to win re-election from constituencies which became reserved for Scheduled Castes. This is most likely because these constituencies have significantly fewer

[14] This is true of the TRS in Andhra Pradesh and the JD(U) in Rajasthan.

candidates entering the race (Columns 2 and 5), and incumbent parties are able to take advantage of this reduced competition by fielding candidates of the "right" social group in these reserved constituencies.

6.3 Estimating Seats-Votes Curves Before and After Redistricting

Most of the prior literature on electoral redistricting in the US has focused on estimating seats-votes curve. The seats-votes curve defines the expected relationship between the seat share and vote share of a given party, and is estimated from observed political outcomes by simulating a range of possible vote share distributions and associated seat shares, under certain assumptions. Gelman and King (1994) pioneered this methodology, which is now widely used and also coded into a computer program (JudgeIt).

Two quantities of interest are typically estimated from these simulations. The first is the partisan bias i.e. the extent to which a given party's seat share always exceeds their vote share, above what would be expected for the opposing party. For instance, if the Congress is able to translate 55% of the average district vote into 75% of the seats, but the BJP is able to translate a similar vote share into only 70% of the seats, we would conclude that the electoral system has a partisan bias towards Congress of about 5%. For the US, Gelman and King (1994b) find an increasing trend in partisan bias towards Democrats in the 1980s, while Coate and Knight (2007) find an overall partisan bias towards Republicans when they use data from the 1990s.

The other quantity of interest is the responsiveness of the seats-votes curve. This is the change in the expected seat share for a small change in the overall vote share. In electoral systems with proportional representation, where seat share is strictly proportional to vote share, the responsiveness is 1. For first-past-the-post systems, this can be greater or less than 1. For the US, responsiveness has been found to be greater than 1in most states; Coate and Knight (2007) estimate an overall value of 2.7 in the 1990s. Electoral redistricting is associated with a decline in partisan bias, and an increase in responsiveness (Gelman and King, 1994b).

We estimated seats-votes curves using the JudgeIt program and the methodology of Gelman and King (1994a).[15] We present results for Rajasthan only at this time. We find two

[15] To apply this in the Indian context, we had to adjust for electoral alliances in computing the vote and seat share of the Indian National Congress. We also computed the two-party vote share by assuming a vote share of zero for Congress whenever the Congress candidate was not among the top two. Our set of regressors included the vote share

important findings. First, there is very little partisan bias, especially as compared to the US: less than 1% in favor of the Congress party. The responsiveness of the seats-votes curves is quite high (around 2.7), similar to that observed in the US. Second, the seats-votes curve looks very similar before and after the redistricting process (Figure 4). The partisan bias in favor of Congress increases slightly (from 0.003 to 0.010), while the responsiveness declines slightly, from 2.7 to 2.56 (Table 9). These trends are different from those in the US, but the changes are very small. This supports the hypothesis that there was little political influence on the redistricting process as a whole, and that the characteristics of the electoral system were largely unchanged as a result. In this sense, we find the Indian redistricting process to be politically neutral, while succeeding at the primary goal of providing more equal representation across constituencies.

7 Conclusions

We studied the recently completed electoral redistricting process in India, which substantially changed the boundaries of both state and national electoral constituencies. We find that, by and large, the process achieved its primary goal of equalizing population sizes across constituencies. More importantly, the redistricting process does not appear to have been influenced by incumbent politicians to a great extent, though we find some evidence that the constituencies of advisory committee members were less likely to undergo changes. Incumbent politicians' electoral prospects are not changed by this redistricting, except through the inability to contest in constituencies reserved for certain sections of society.

Our study constitutes a methodological advance in proposing simple measures of the extent of redistricting of specific constituencies, which can be easily computed with the availability of GIS data to match up the boundaries of old and new constituencies. As such, this methodology is generalizable to other countries and electoral systems. The results from this analysis are consistent with those found using the earlier methodology of estimating seats-votes curves. In both cases, we find that the redistricting process did not make a large difference to either the advantage enjoyed by the incumbent party or the electoral prospects of incumbent politicians. An important policy conclusion of our study is that it is possible to implement

in the previous election, demographic characteristics of the constituency, a dummy for whether the Congress won the seat in the previous election, and a dummy for whether the incumbent politician was contesting the election.

politically neutral redistricting plans in a developing country, provided that a non-political body is in charge of the process, and that the process is extremely transparent and inclusive of all relevant stakeholders.

References

Baqir, Reza. 2002. "Districting and Government Overspending." *Journal of Political Economy* 110.

Barooah, Vani. 2006. "Incumbency and Parliamentary Elections in India." *Economic & Political Weekly* 41 (8): 739-746.

Besley, Timothy and Ian Preston. 2007. "Electoral Bias and Policy Choice: Theory and Evidence." *Quarterly Journal of Economics* 122(4), 1473-1510.

Coate, Stephen and Brian Knight. 2007. "Socially Optimal Districting: A Theoretical and Empirical Exploration." *Quarterly Journal of Economics* 122(4): 1409-1471.

Friedman, John and Richard Holden. 2008. "Optimal Gerrymandering: Sometimes Pack but Never Crack." *American Economics Review* 98:113-144.

Friedman, John and Richard Holden. 2009. "The Rising Incumbent Advantage: What's Gerrymandering Got To Do With It?" *Journal of Politics* 71(2): 593-611.

Gelman, Andrew and Gary King. 1994a. "A Unified Method of Evaluating Electoral Systems and Redistricting Plans." *American Journal of Political Science* 38 (2): 514-54.

Gelman, Andrew and Gary King. 1994b. "Enhancing Democracy through Legislative Redistricting." *American Political Science Review* 88(3).

Kastellec, Jonathan P., Andrew Gelman and Jamie P.Chandler. 2008a. "Predicting and Dissecting the Seats-Votes Curve in the 2006 U.S. House Election." *PS: Political Science and Politics.*

Kastellec, Jonathan P., Andrew Gelman and Jamie P.Chandler. 2008b. "The playing field shifts: predicting the seats-votes curve in the 2008 U.S. House election." *PS: Political Science and Politics.*

Linden, Leigh. 2004. "Are Incumbents Really Advantaged? The Preference for Non-Incumbents in Indian National Elections." Working Paper, Columbia University. http://www.columbia.edu/~ll2240/Incumbency% 20Disad.pdf.

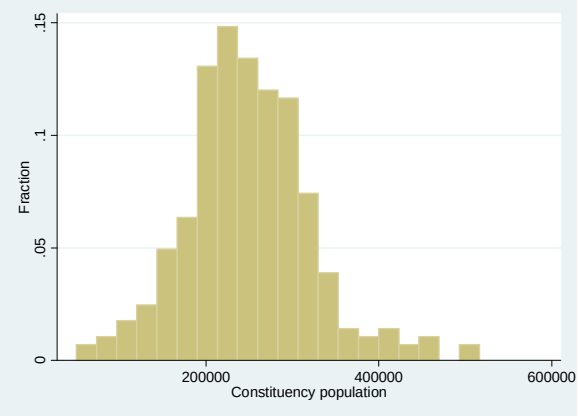
Ravishankar, Nirmala. 2009. "The Cost of Ruling: Anti-Incumbency in Elections." *Economic and Political Weekly* 54 (10): 92-98.

Uppal, Yogesh. 2009. "The Disadvantaged Incumbents: Estimating Incumbency Effects in Indian State Legislatures." *Public Choice* 138: 9-27.

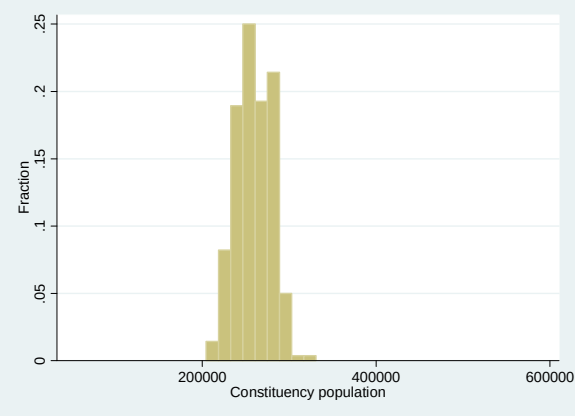
Figure 1: Distribution of Demographic Characteristics (Andhra Pradesh)

Constituency Population

A. Before Redistricting

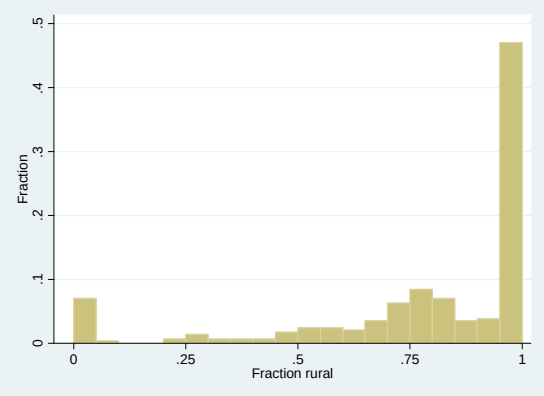


B. After Redistricting

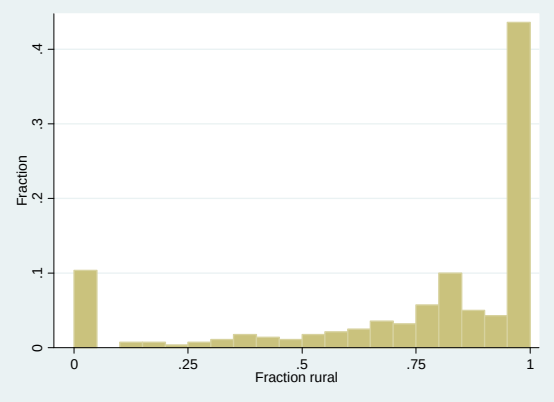


Proportion Rural Population

C. Before Redistricting

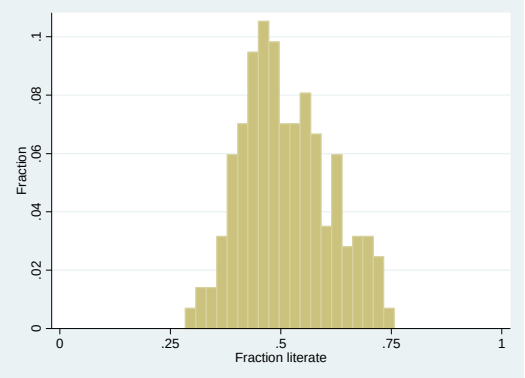


D. After Redistricting



Proportion Literate

E. Before Redistricting



F. After Redistricting

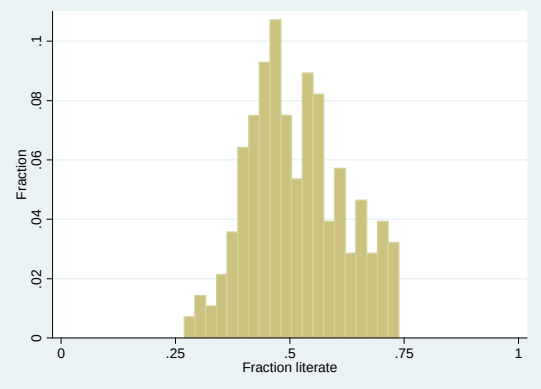
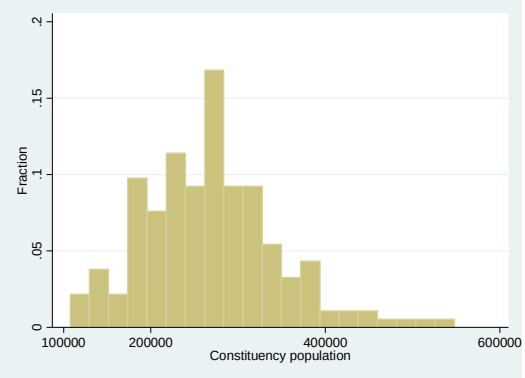


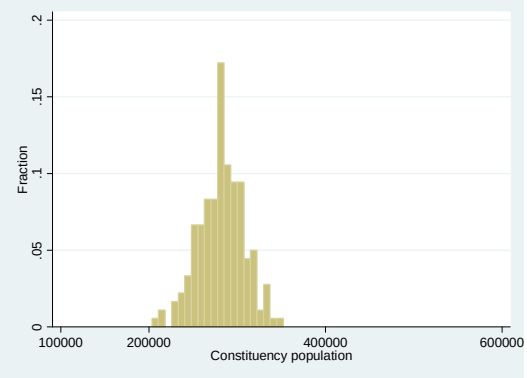
Figure 2: Distribution of Demographic Characteristics (Rajasthan)

Constituency Population

A. Before Redistricting

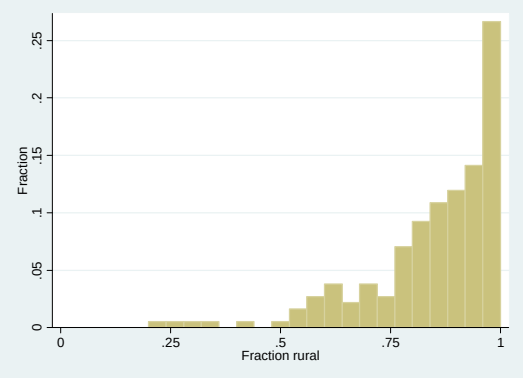


B. After Redistricting

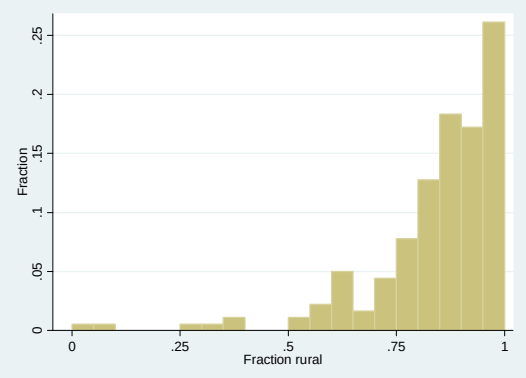


Proportion Rural Population

C. Before Redistricting

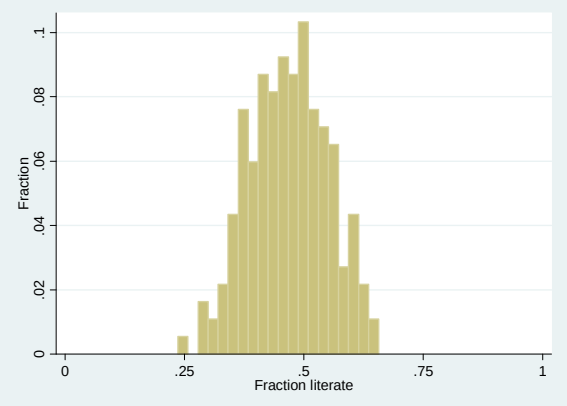


D. After Redistricting



Proportion Literate

E. Before Redistricting



F. After Redistricting

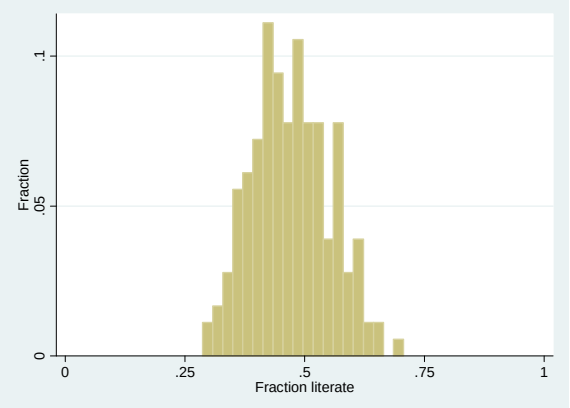


Figure 3: Probability of Contesting the Next Election

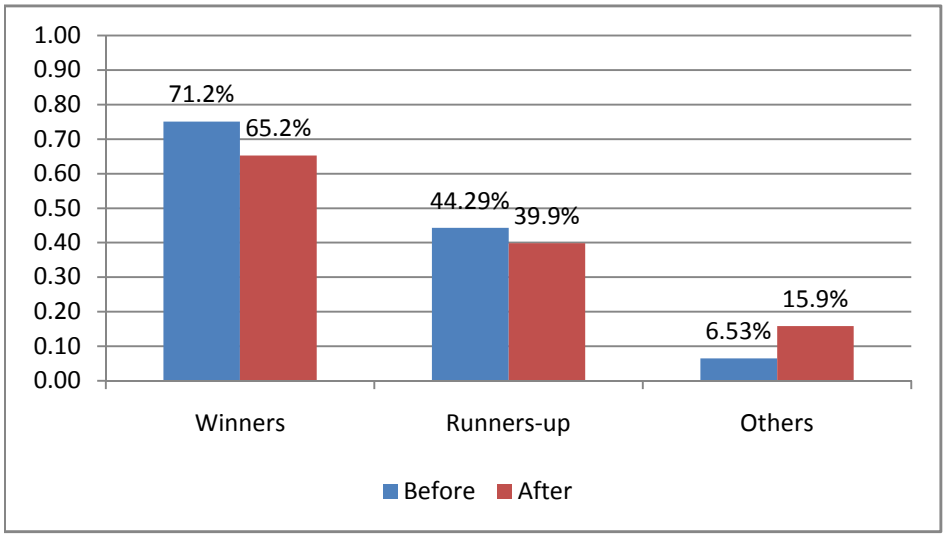
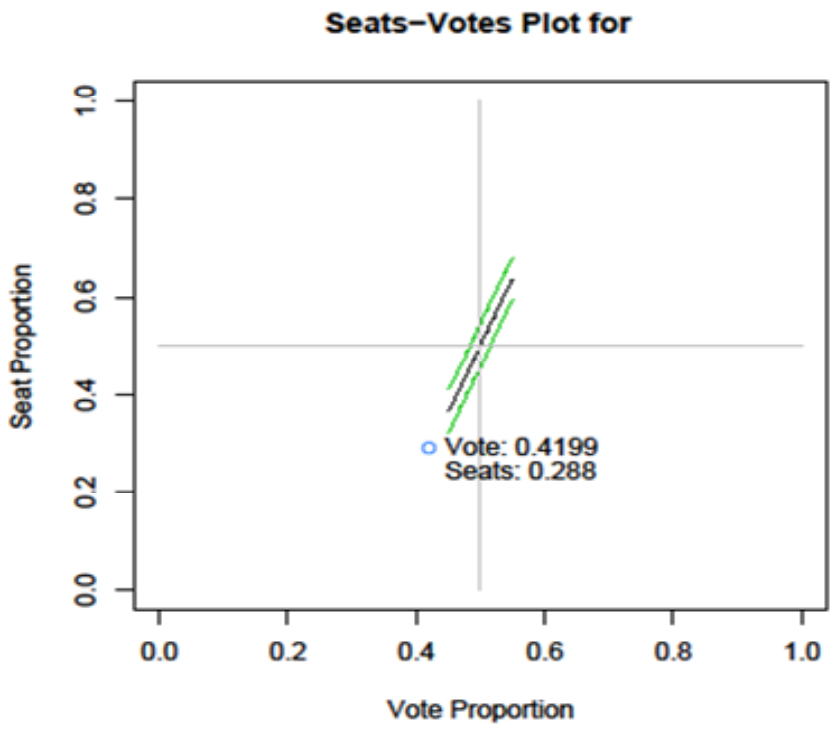


Figure 4: Seats-Votes Curves before and after Redistricting (Rajasthan state)

A. Before redistricting



B. After redistricting

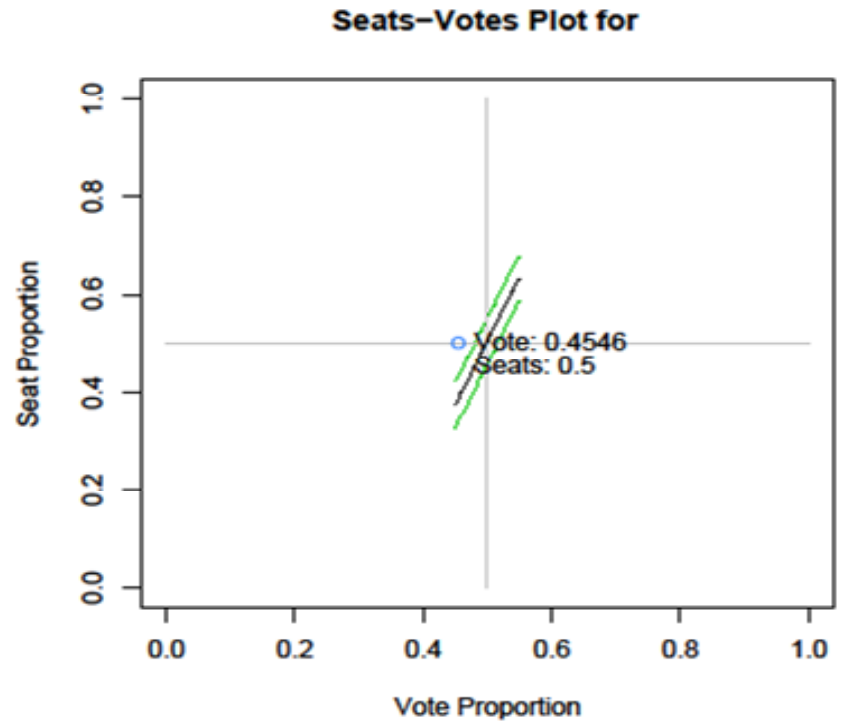


Figure A.1: Old and New Constituency Boundaries in Adilabad District, Andhra Pradesh

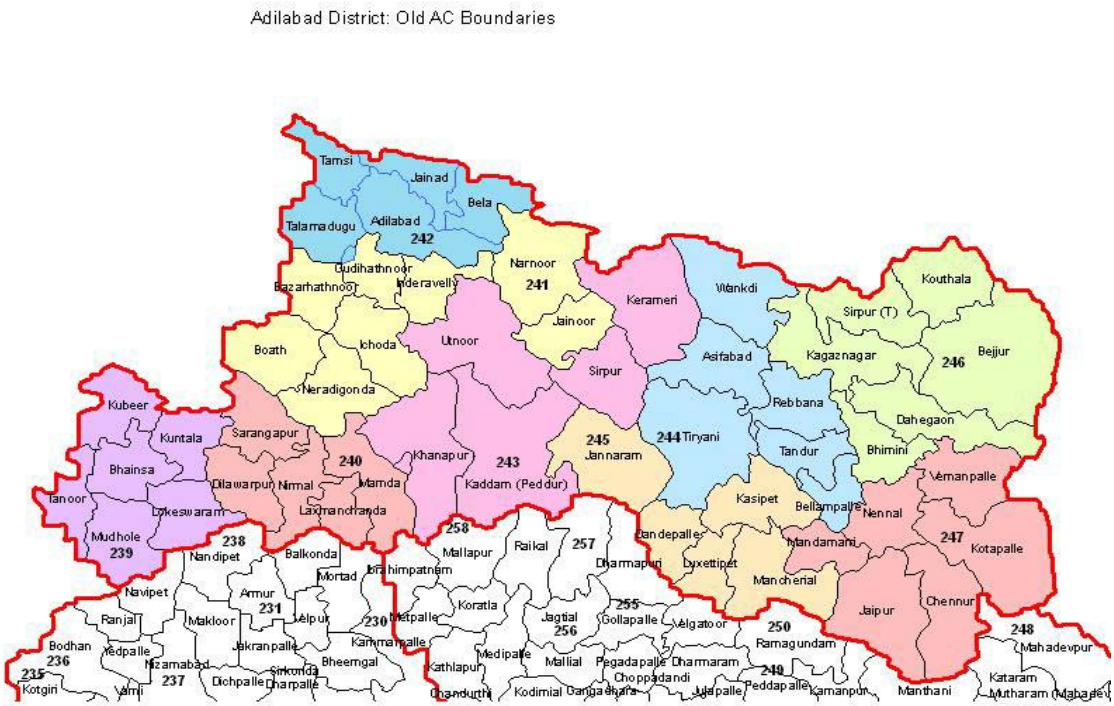


Table 1: Summary Statistics

	Andhra Pradesh				Rajasthan			
Variable	Obs	Mean	Min	Max	Obs	Mean	Min	Max
Demographics (pre-redistricting)								
Constituency population	283	248343	52852	516526	182	269654	107537	547910
Fraction Scheduled Castes	283	0.169	0.007	0.334	182	0.175	0.016	0.407
Fraction Scheduled Tribes	283	0.069	0.003	0.915	182	0.141	0.000	0.885
Fraction literate	283	0.511	0.284	0.757	182	0.469	0.236	0.657
Male-female ratio	283	1.019	0.904	1.099	182	1.080	0.926	1.229
Fraction rural	283	0.795	0.000	1.000	182	0.851	0.200	1.000
Political outcomes								
# candidates	283	6.353	2	16	182	7.495	2	18
Voter turnout (fraction)	283	0.721	0.415	0.865	182	0.683	0.507	0.805
Vote share margin of winner	283	0.122	0.001	0.606	182	0.088	0.001	0.397
Vote share of incumbent party	283	0.474	0.000	0.674	182	0.386	0.000	0.654
Vote share of opposition party	283	0.405	0.081	0.699	182	0.351	0.087	0.572
Extent of Redelimitation								
Population-based measure	283	0.369	0	1.303	182	0.757	0.115	1.437
Demographic measure	283	0.030	0	0.209	182	0.011	0.000	0.257
Expected change in incumbent party vote share	283	0.044	0	0.367	182	0.037	0.000	0.299
Expected change in political competition	283	0.012	0	0.097	182	0.005	0.000	0.077

Table 2: Correlations among Different Measures of the Extent of Redistricting

	Population-based measure	Demographic measure	Expected change in incumbent party vote share	Expected change in political competition
Population-based measure	1			
Demographic measure	0.2364	1		
Expected change in incumbent party vote share	0.4537	0.2436	1	
Expected change in political competition	0.4119	0.2472	0.429	1

Table 3: Determinants of Extent of Redistricting: Population-based and Demographic Measures

	Dependent variable: Extent of Redistricting					
	Population-based measure			**Demographic measure**		
	(1)	(2)	(3)	(4)	(5)	(6)
Population deviation	0.077***	0.088***	0.090***	0.018***	0.018***	0.018***
	(0.029)	(0.029)	(0.030)	(0.005)	(0.005)	(0.005)
% Scheduled Castes		0.238	0.266		0.027	0.026
		(0.303)	(0.307)		(0.024)	(0.025)
% Scheduled Tribes		0.073	0.084		0.018	0.018*
		(0.115)	(0.117)		(0.011)	(0.011)
% literate		0.501**	0.523**		0.003	0.004
		(0.234)	(0.232)		(0.022)	(0.022)
Male-female ratio		0.384	0.306		0.017	0.017
		(0.351)	(0.352)		(0.028)	(0.029)
% rural		0.395***	0.391***		-0.008	-0.008
		(0.080)	(0.080)		(0.010)	(0.010)
Incumbent party vote share			0.639			0.024
			(0.458)			(0.047)
Incumbent party vote share^2			-1.063*			-0.032
			(0.642)			(0.063)
Incumbent politician is advisory member			-0.124			-0.010***
			(0.080)			(0.002)
Observations	465	465	465	465	465	465
R-squared	0.06	0.11	0.12	0.09	0.10	0.10

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
Regressions exclude four observations with extremely high values of population deviation and victory margin.
Regressions include state fixed effects.

Table 4: Determinants of Extent of Redistricting: Voting Measures

	Dependent variable: Extent of Redistricting					
	Expected change in incumbent party vote share			**Expected change in political competition**		
	(1)	(2)	(3)	(4)	(5)	(6)
Population deviation	0.012**	0.013**	0.013**	0.004**	0.004***	0.004***
	(0.006)	(0.006)	(0.006)	(0.001)	(0.001)	(0.001)
% Scheduled Castes		0.000	0.029		0.020	0.018
		(0.038)	(0.040)		(0.013)	(0.013)
% Scheduled Tribes		0.020	0.014		0.001	0.001
		(0.021)	(0.018)		(0.003)	(0.003)
% literate		0.052*	0.039		0.012**	0.011**
		(0.026)	(0.028)		(0.005)	(0.006)
Male-female ratio		0.077*	0.033		0.018	0.020*
		(0.046)	(0.049)		(0.012)	(0.012)
% rural		0.038***	0.040***		0.007***	0.007***
		(0.010)	(0.010)		(0.002)	(0.002)
Incumbent party vote share			-0.277***			-0.010
			(0.101)			(0.015)
Incumbent party vote share^2			0.282**			0.018
			(0.126)			(0.022)
Incumbent politician is advisory member			-0.009			-0.004***
			(0.008)			(0.001)
Observations	465	465	465	465	465	465
R-squared	0.03	0.06	0.14	0.03	0.07	0.08

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
Regressions exclude four observations with extremely high values of population deviation and victory margin.
Regressions include state fixed effects.

Table 5: Extent of Redistricting and the Probability of Running for Re-election

	Population-based measure			Demographic measure			Expected change in incumbent party vote share			Expected change in political competition		
	Winners	Runners-up	Others	Winners	Runners-up	Others	Winners	Runners-up	Others	Winners	Runners-up	Others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Extent of Redistricting	-0.050	0.020	-0.050**	0.557	-0.138	-0.085	0.095	-0.019	-0.103	0.723	-1.038	0.025
	(0.067)	(0.065)	(0.023)	(0.593)	(0.655)	(0.246)	(0.490)	(0.468)	(0.175)	(0.577)	(0.652)	(0.301)
New constituency reserved for SC	-0.139**	-0.100	0.001	-0.139**	-0.100	0.004	-0.138**	-0.100	0.005	-0.140**	-0.096	0.003
	(0.067)	(0.065)	(0.022)	(0.067)	(0.065)	(0.022)	(0.067)	(0.065)	(0.022)	(0.067)	(0.065)	(0.022)
New constitutency reserved for ST	-0.093	0.060	0.035	-0.098	0.061	0.029	-0.096	0.061	0.030	-0.093	0.056	0.029
	(0.138)	(0.137)	(0.056)	(0.136)	(0.137)	(0.056)	(0.137)	(0.137)	(0.056)	(0.138)	(0.136)	(0.056)
Victory margin in previous election	0.381	1.028***	0.183**	0.388	1.031***	0.183**	0.378	1.029***	0.182**	0.374	1.018***	0.183**
	(0.247)	(0.256)	(0.086)	(0.247)	(0.256)	(0.086)	(0.248)	(0.256)	(0.086)	(0.247)	(0.256)	(0.086)
Ruling party dummy	-0.064	-0.110*	0.027	-0.062	-0.109*	0.027	-0.060	-0.109*	0.029	-0.063	-0.112*	0.027
	(0.046)	(0.062)	(0.070)	(0.045)	(0.062)	(0.069)	(0.046)	(0.062)	(0.069)	(0.046)	(0.062)	(0.069)
% Scheduled Castes	-0.370	0.096	-0.202	-0.397	0.106	-0.215	-0.386	0.103	-0.223	-0.397	0.117	-0.217
	(0.454)	(0.468)	(0.161)	(0.455)	(0.470)	(0.161)	(0.456)	(0.470)	(0.160)	(0.456)	(0.467)	(0.160)
% Scheduled Tribes	0.220	-0.228	0.109	0.211	-0.225	0.115	0.219	-0.227	0.114	0.216	-0.222	0.113
	(0.246)	(0.266)	(0.113)	(0.244)	(0.266)	(0.113)	(0.245)	(0.266)	(0.113)	(0.245)	(0.265)	(0.113)
% literate	-0.164	-0.182	0.040	-0.175	-0.177	0.021	-0.185	-0.174	0.025	-0.185	-0.170	0.022
	(0.115)	(0.126)	(0.041)	(0.114)	(0.123)	(0.040)	(0.115)	(0.125)	(0.040)	(0.114)	(0.123)	(0.040)
Male-female ratio	-0.087	-0.141	0.087	-0.114	-0.131	0.064	-0.117	-0.131	0.071	-0.118	-0.121	0.065
	(0.311)	(0.311)	(0.121)	(0.310)	(0.309)	(0.121)	(0.312)	(0.311)	(0.121)	(0.310)	(0.309)	(0.121)
% rural	-0.474	-1.044*	-0.022	-0.506	-1.032*	-0.059	-0.494	-1.035*	-0.050	-0.493	-1.033*	-0.060
	(0.578)	(0.600)	(0.192)	(0.579)	(0.599)	(0.193)	(0.577)	(0.600)	(0.193)	(0.576)	(0.592)	(0.193)
Observations	469	469	2273	469	469	2273	469	469	2273	469	469	2273
R-squared	0.05	0.07	0.04	0.05	0.07	0.04	0.05	0.07	0.04	0.05	0.07	0.04

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
Regressions include state fixed effects.

Table 6: Party Identity and Probability of Running for Re-election after Redistricting

	Population-based measure			**Demographic measure**			**Expected change in incumbent**			**Expected change in political**		
	INC	Opposition	Third parties	INC	Opposition	Third parties	INC	Opposition	Third parties	INC	Opposition	Third parties
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Extent of Redistricting	0.038	-0.010	-0.072***	0.439	0.072	-0.124	-0.436	0.006	-0.018	-0.704	1.069*	0.109
	(0.069)	(0.068)	(0.023)	(0.641)	(0.721)	(0.251)	(0.427)	(0.546)	(0.177)	(0.623)	(0.583)	(0.313)
New constituency reserved for SC	-0.212***	-0.119**	-0.012	-0.212***	-0.120**	-0.013	-0.207***	-0.120*	-0.014	-0.207***	-0.124**	-0.015
	(0.057)	(0.061)	(0.020)	(0.058)	(0.061)	(0.020)	(0.058)	(0.061)	(0.020)	(0.058)	(0.061)	(0.020)
New constitutency reserved for ST	-0.005	-0.036	0.102***	-0.005	-0.036	0.099***	0.001	-0.036	0.098***	-0.006	-0.032	0.098***
	(0.080)	(0.084)	(0.038)	(0.080)	(0.084)	(0.038)	(0.080)	(0.084)	(0.037)	(0.080)	(0.084)	(0.038)
Victory margin in previous election	1.347***	0.849***	0.605***	1.335***	0.847***	0.601***	1.320***	0.847***	0.601***	1.329***	0.827***	0.603***
	(0.173)	(0.170)	(0.060)	(0.173)	(0.169)	(0.060)	(0.176)	(0.171)	(0.060)	(0.173)	(0.170)	(0.060)
Observations	410	442	2359	410	442	2359	410	442	2359	410	442	2359
R-squared	0.16	0.07	0.09	0.16	0.07	0.08	0.16	0.07	0.08	0.16	0.07	0.08

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
Regressions include state fixed effects.

Table 7: Extent of Redistricting and the Probability of Winning Re-election

	Population-based measure			Demographic measure			Expected change in incumbent party vote share			Expected change in political competition		
	Winners	Runners-up	Others	Winners	Runners-up	Others	Winners	Runners-up	Others	Winners	Runners-up	Others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Extent of Redistricting	0.013	0.104**	-0.003	-0.457	0.422	-0.042	0.299	0.298	-0.005	1.854***	-0.475	-0.027
	(0.064)	(0.047)	(0.006)	(0.542)	(0.563)	(0.029)	(0.487)	(0.354)	(0.034)	(0.536)	(0.444)	(0.018)
New constituency reserved for SC	-0.470	0.464	-0.105***	-0.457	0.493	-0.105***	-0.461	0.508	-0.107***	-0.491	0.506	-0.106***
	(0.418)	(0.372)	(0.040)	(0.417)	(0.373)	(0.040)	(0.419)	(0.376)	(0.040)	(0.417)	(0.376)	(0.040)
New constitutency reserved for ST	0.127	0.103	-0.021	0.134	0.097	-0.020	0.123	0.101	-0.020	0.117	0.106	-0.020
	(0.228)	(0.228)	(0.022)	(0.227)	(0.229)	(0.022)	(0.227)	(0.228)	(0.022)	(0.226)	(0.228)	(0.022)
Victory margin in previous election	-0.081	-0.153*	0.018**	-0.082	-0.112	0.017*	-0.088	-0.128	0.017*	-0.086	-0.114	0.017*
	(0.117)	(0.090)	(0.009)	(0.117)	(0.086)	(0.009)	(0.118)	(0.090)	(0.009)	(0.117)	(0.087)	(0.009)
Ruling party dummy	-0.002	-0.412*	-0.026	0.006	-0.365	-0.028	-0.012	-0.378	-0.028	-0.014	-0.358	-0.028
	(0.284)	(0.238)	(0.028)	(0.287)	(0.236)	(0.028)	(0.287)	(0.237)	(0.028)	(0.286)	(0.236)	(0.028)
% Scheduled Castes	0.228	-1.046**	0.020	0.246	-1.019**	0.018	0.214	-1.029**	0.018	0.222	-1.005**	0.017
	(0.537)	(0.459)	(0.048)	(0.538)	(0.460)	(0.048)	(0.537)	(0.457)	(0.050)	(0.540)	(0.457)	(0.048)
% Scheduled Tribes	0.006	-0.095**	-0.001	0.007	-0.100**	-0.001	0.003	-0.101**	-0.001	-0.001	-0.097**	-0.001
	(0.059)	(0.045)	(0.004)	(0.059)	(0.045)	(0.004)	(0.059)	(0.045)	(0.004)	(0.058)	(0.045)	(0.004)
% literate	-0.092	-0.002	-0.008	-0.089	0.003	-0.008	-0.092	0.002	-0.008	-0.084	0.002	-0.009
	(0.100)	(0.124)	(0.012)	(0.099)	(0.122)	(0.013)	(0.100)	(0.123)	(0.013)	(0.099)	(0.123)	(0.013)
Male-female ratio	0.837***	0.654***	0.063*	0.832***	0.653***	0.063*	0.825***	0.666***	0.063*	0.816***	0.653***	0.062*
	(0.230)	(0.175)	(0.033)	(0.232)	(0.176)	(0.033)	(0.231)	(0.177)	(0.033)	(0.230)	(0.176)	(0.033)
% rural	-0.022	-0.108***	0.006	-0.022	-0.104**	0.005	-0.019	-0.103**	0.006	-0.027	-0.105**	0.006
	(0.042)	(0.041)	(0.026)	(0.041)	(0.041)	(0.026)	(0.042)	(0.041)	(0.026)	(0.041)	(0.041)	(0.026)
Observations	469	469	2273	469	469	2273	469	469	2273	469	469	2273
R-squared	0.05	0.08	0.01	0.05	0.07	0.01	0.05	0.07	0.01	0.06	0.07	0.01

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
Regressions include state fixed effects.

Table 8: Political Competition and Party Outcomes

	Population-based measure			Demographic measure		
Dependent variable -->	Political party retains seat	#Candidates	Victory margin	Political party retains seat	#Candidates	Victory margin
	(1)	(2)	(3)	(4)	(5)	(6)
Extent of Redistricting	0.060	0.485	0.010	0.075	3.572	-0.051
	(0.069)	(0.425)	(0.013)	(0.811)	(5.263)	(0.089)
New constituency reserved for SC	0.198***	-1.331***	0.005	0.197***	-1.346***	0.005
	(0.066)	(0.464)	(0.009)	(0.066)	(0.462)	(0.009)
New constitutency reserved for ST	0.120	-1.463*	0.017	0.123	-1.454*	0.017
	(0.134)	(0.771)	(0.021)	(0.134)	(0.782)	(0.021)
Ruling party dummy	0.077	-0.229	-0.001	0.074	-0.261	-0.001
	(0.051)	(0.345)	(0.008)	(0.051)	(0.346)	(0.008)
% Scheduled Castes	-0.950**	1.523	-0.195**	-0.928*	1.634	-0.190**
	(0.470)	(3.336)	(0.087)	(0.473)	(3.324)	(0.087)
% Scheduled Tribes	-0.329	-1.463	0.006	-0.329	-1.504	0.007
	(0.268)	(1.699)	(0.047)	(0.267)	(1.706)	(0.047)
% literate	0.523	4.102*	-0.014	0.551*	4.326**	-0.009
	(0.329)	(2.099)	(0.050)	(0.328)	(2.080)	(0.049)
Male-female ratio	0.206	23.853***	0.055	0.225	23.922***	0.060
	(0.609)	(4.325)	(0.095)	(0.607)	(4.321)	(0.096)
% rural	-0.006	-1.334	-0.046*	0.017	-1.115	-0.043*
	(0.132)	(0.873)	(0.027)	(0.130)	(0.862)	(0.026)
Observations	465	465	465	465	465	465
R-squared	0.06	0.24	0.06	0.06	0.24	0.06

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
Regressions exclude four observations with extremely high values of population deviation and victory margin.
Regressions include state fixed effects.

Table 9: Partisan Bias and Responsiveness of Seats-Votes Curve Before and After Redistricting

Rajasthan	Before	After
Partisan Bias	0.003	0.010
	(0.032)	(0.035)
Responsiveness	2.713	2.559
	(0.327)	(0.335)

Partisan bias is positive if electoral map displays partisan bias towards Indian National Congress.
Both partisan bias and responsiveness are estimated in the vote share range 0.45-0.55.
Estimates generated from JudgeIt program, based on the methodology of Gelman and King (1994).
Covariates include the vote share of Congress in previous election, whether the incumbent politician contests the election, demographic characteristics and whether Congress won the seat in the previous election.
Dependent variable is the vote share for Congress, computed as a fraction of the votes for the top two parties in each constituency.
Values are generated by simulating the distribution of seats and votes with 1000 replications. Numbers in parantheses represent the standard deviation from this exercise.

Appendix Table 1: Is Population Deviation a Significant Predictor of Prior Political Outcomes?

Andhra Pradesh

	#candidates	Victory margin	INC alliance vote share	Opposition alliance vote share	Voter turnout
	(1)	(2)	(3)	(4)	(5)
Population deviation	-0.021*	0.008	-0.006	-0.002	0.008
	(0.012)	(0.010)	(0.010)	(0.011)	(0.007)
% Scheduled Castes	-0.010	-0.075	0.147	0.040	0.024
	(0.103)	(0.098)	(0.094)	(0.087)	(0.050)
% Scheduled Tribes	-0.043	-0.018	-0.127***	-0.106**	-0.031
	(0.035)	(0.044)	(0.045)	(0.045)	(0.037)
% literate	0.256***	-0.071	0.084	0.025	0.127***
	(0.062)	(0.057)	(0.071)	(0.053)	(0.033)
Male-female ratio	1.316***	0.089	-0.471**	-0.388*	-0.294***
	(0.233)	(0.195)	(0.230)	(0.207)	(0.111)
% rural	-0.033	0.000	0.068**	0.063***	0.178***
	(0.029)	(0.023)	(0.027)	(0.021)	(0.012)
Observations	283	283	283	283	283
R-squared	0.23	0.01	0.13	0.11	0.54

Rajasthan

	#candidates	Victory margin	INC alliance vote share	Opposition alliance vote share	Voter turnout
	(1)	(2)	(3)	(4)	(5)
Population deviation	0.009	0.005	0.002	0.000	-0.007
	(0.013)	(0.007)	(0.010)	(0.014)	(0.009)
% Scheduled Castes	-0.085	-0.058	-0.111	0.258	-0.149
	(0.140)	(0.066)	(0.111)	(0.164)	(0.105)
% Scheduled Tribes	-0.043	-0.005	0.008	-0.030	-0.088***
	(0.054)	(0.022)	(0.038)	(0.071)	(0.029)
% literate	0.172*	0.054	-0.069	-0.361***	0.085
	(0.099)	(0.053)	(0.091)	(0.134)	(0.059)
Male-female ratio	0.508***	-0.098	-0.450***	-0.574***	0.178**
	(0.142)	(0.072)	(0.112)	(0.153)	(0.080)
% rural	-0.178***	0.027	-0.039	-0.160**	0.034
	(0.053)	(0.028)	(0.044)	(0.063)	(0.028)
Observations	182	182	182	182	182
R-squared	0.26	0.04	0.17	0.12	0.13

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
Regressions exclude four observations with extremely high values of population deviation and victory margin.
INC: Indian National Congress

Appendix Table 2: Determinants of Extent of Redelimitation (Using Population instead of Population Deviation from District Average)

	Population-based measure			Demographic measure			Expected change in incumbent party vote share			Expected change in political competition		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Constituency Population	-0.241***	-0.207***	-0.203***	-0.057***	-0.057***	-0.057***	-0.053***	-0.050***	-0.054***	-0.015***	-0.015***	-0.015***
	(0.078)	(0.076)	(0.077)	(0.016)	(0.016)	(0.016)	(0.017)	(0.017)	(0.017)	(0.005)	(0.005)	(0.005)
Population-squared	0.033**	0.031**	0.031**	0.010***	0.010***	0.010***	0.006**	0.006**	0.006**	0.002***	0.002***	0.002***
	(0.013)	(0.013)	(0.014)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)
% Scheduled Castes		0.240	0.266		0.031	0.030		0.000	0.028		0.020	0.018
		(0.304)	(0.307)		(0.024)	(0.025)		(0.035)	(0.036)		(0.013)	(0.012)
% Scheduled Tribes		0.086	0.096		0.020*	0.020*		0.021	0.014		0.002	0.001
		(0.114)	(0.117)		(0.011)	(0.011)		(0.020)	(0.017)		(0.003)	(0.003)
% literate		0.434*	0.454*		-0.003	-0.003		0.020	0.006		0.004	0.003
		(0.235)	(0.234)		(0.022)	(0.022)		(0.026)	(0.027)		(0.005)	(0.005)
Male-female ratio		0.460	0.386		0.007	0.007		0.123***	0.080*		0.028**	0.030**
		(0.356)	(0.357)		(0.026)	(0.027)		(0.045)	(0.047)		(0.012)	(0.012)
% rural		0.342***	0.338***		-0.012	-0.012		0.015	0.017*		0.001	0.001
		(0.083)	(0.083)		(0.010)	(0.010)		(0.010)	(0.010)		(0.002)	(0.002)
Incumbent party vote share			0.575			0.009			-0.297***			-0.015
			(0.460)			(0.048)			(0.097)			(0.014)
Incumbent party vote share^2			-0.969			-0.013			0.310**			0.025
			(0.645)			(0.064)			(0.121)			(0.021)
Incumbent politician is advisory member			-0.124			-0.008***			-0.013			-0.004***
			(0.082)			(0.002)			(0.009)			(0.001)
Observations	465	465	465	465	465	465	465	465	465	465	465	465
R-squared	0.07	0.11	0.12	0.11	0.12	0.12	0.13	0.15	0.23	0.12	0.15	0.15

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Regressions exclude four observations with extremely high values of population deviation and victory margin.

Regressions include state fixed effects.