Online Appendix to "None Of The Above"

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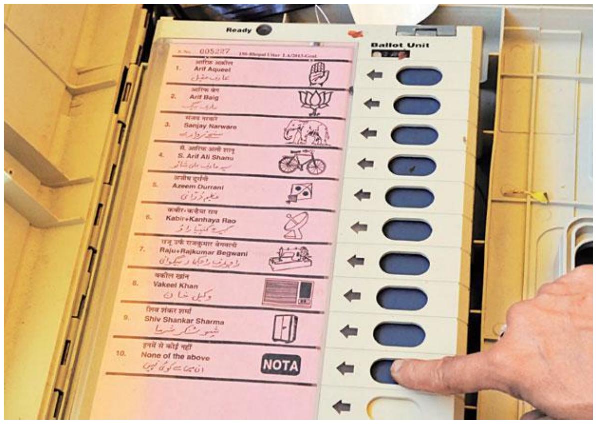
Abstract

This Appendix, not intended for publication, contains further details on our data, analysis, and results.

1 Background and data

Figure 1: Electronic voting machine with NOTA included



1.1 Construction of the dataset

1.1.1 Rainfall and Broadcast allowance

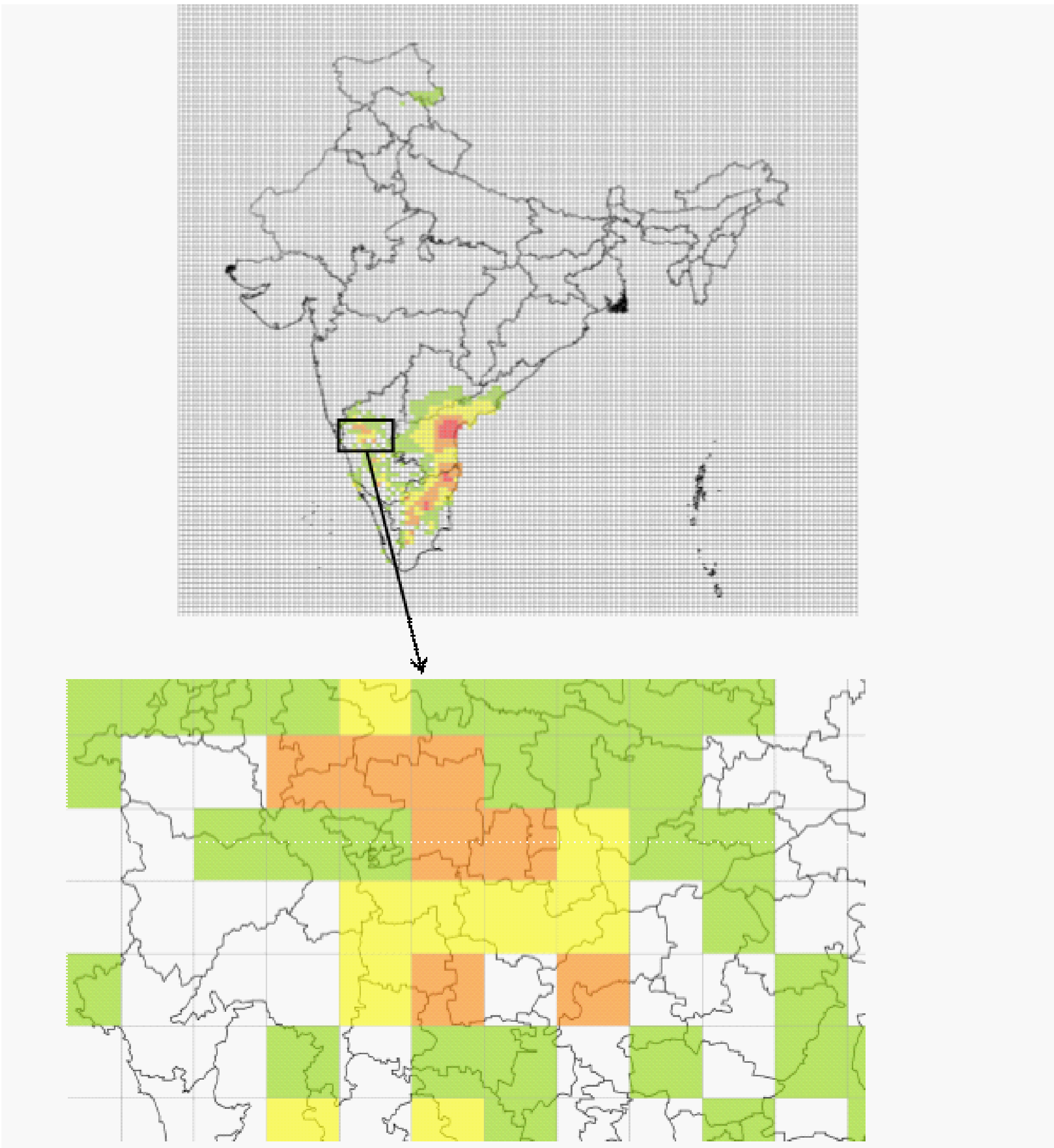
The rainfall variable is created based on gridded daily rainfall data obtained from the India Meteorological Department in 0.25×0.25 degree cells. We match this grid to constituency boundaries and take the area-weighted average of the cells covering each administrative area. Figure 2 illustrates the size of the rainfall grid relative to the constituencies.

Source: India Meteorological Department: New High Spatial Resolution (0.25X0.25 degree) Long Period (1901-2015) Daily Gridded Rainfall Data Set Over India (CD-ROM).

The Broadcast Allowance is total time allotted in minutes for Broadcast and Telecast in an election cycle. Political parties are provided free access to State owned Television and Radio for an allotted amount time. A base time is given to each National Party and Recognised State Party (recognized in the State) uniformly. Additional time is allotted to the parties on the basis of the poll performance of the parties in the last Lok Sabha and State Assembly election.

Source: Election Commission of India, http://eci.nic.in/eci_main1/Press_Release2013.aspx, http://eci.nic.in/eci_main1/press_release2008.aspx

Figure 2: Example of daily rainfall grid and constituency boundaries (November 29, 2008)



1.1.2 GIS matching of Census data to electoral data at the constituency level

GIS matching of the Census and electoral data is necessary because in India the Census areas and the constituencies do not coincide. Boundary files for the 2013 electoral constituencies are publicly available. In order to match the electoral data to the most recent (2011) Census data, we need to overcome the difficulty that the 2011 Census boundary files are not publicly available. We do this using boundary files from the previous (2001) Census. We first match villages in the 2011 and the 2001 Census using village names. Next, we match the 2001 sub-districts to each 2013 electoral constituency using GIS boundary files.[1] Details of the matching are described below.

I. Matching villages in the 2001 and the 2011 census. Administrative boundaries in India change over time, with sub-districts, districts, and even states splitting up into new units. Our matching procedure is based on the smallest administrative unit available in the Census, the village. To match village names in the 2001 and 2011 census, we proceeded through the following steps. The detailed results for each step are described in Table 1.

1. Eliminate duplicate village names in every sub-district in both the 2001 and the 2011 dataset.

2. Match the two datasets by (state, district name, sub-district name, village name). One state, Rajasthan, had a new district created in 2011 (Pratapgarh) which was carved out from 3 other districts (Chittaurgarh, Udaipur, and Banswara). For this state, we repeated this step three times, replacing the new district name with each of the three parent districts.

3. For the villages not yet matched, repeat the match by (state, district name, village name). This results in additional matches, reflecting changes in the boundaries of sub-districts within districts

4. For the villages not yet matched, allow for variations in spelling. Specifically, for villages not yet matched we repeat the match by (state, district name, village name), allowing for the following variations in both the 2001 and 2011 datasets:[2]

(i) Double letters (e.g., two r instead of one) for each letter in a village name.

(ii) One of the following extra letters anywhere in the village name: a, h, e, n, i; or an extra u after o.

(iii) A one-letter change in the village name: a to e, r to d, t to r, h to n, d to g, n to g, o to u.

These resulted in a small number of additional matches (see Table 1).

[1] Sub-districts, called tehsils in most states, are administrative units above the villages and below the districts and the states.

[2] We established these rules by running the match and inspecting the unmatched names, and then including any reasonable new match as a new rule.

Table 1: Detailed results of the matching procedure

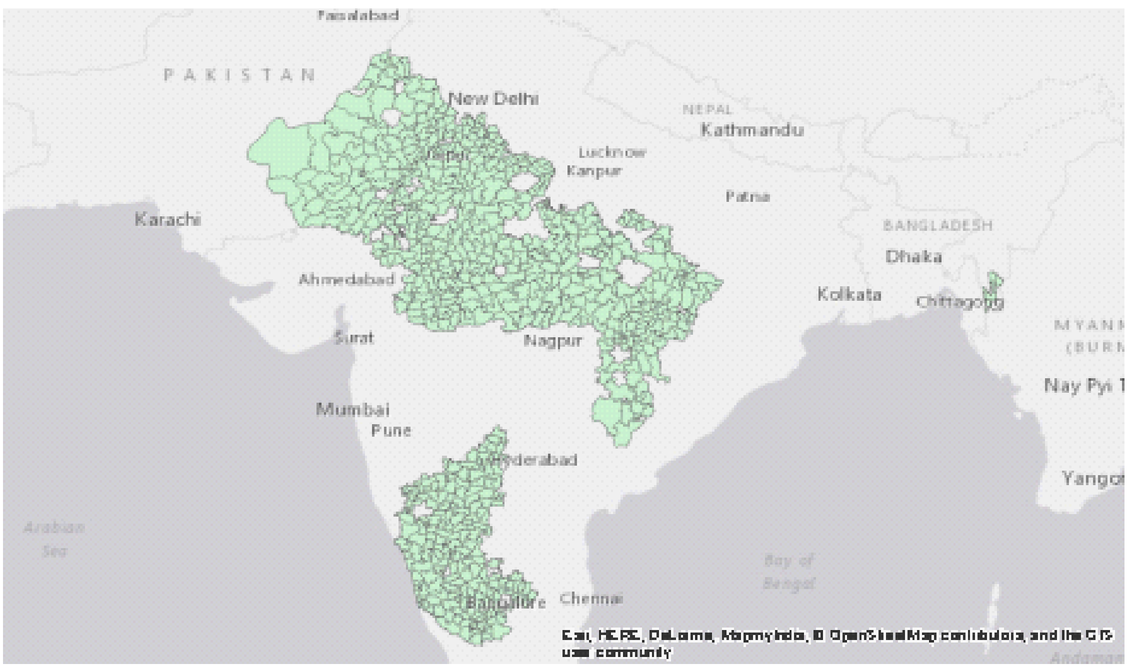
State	Karnataka	Chhattisgarh	Madhya Pradesh	Mizoram	Rajasthan
Step 1					
Villages in 2001 census (a)	27,783	19,860	52,548	729	39,993
Duplicate village names 2001 (b)	1,387	1,634	3,513	0	1,150
Share (b/a)	5%	8%	7%	0%	3%
Villages 2001 without duplicates (a-b)	26,396	18,226	49,035	729	38,843
Villages in 2011 census (c)	27,710	19,637	52,352	726	43,497
Duplicate village names 2011 (d)	1,434	1,030	2,720	0	1,423
Share (d/c)	5%	5%	5%	0%	3%
Villages 2011 without duplicates (c-d)	26,276	18,607	49,632	726	42,074
Step 2: Simple matches (e)	25,676	11,791	38,943	593	34,049
Step 3: Matched without sub-district name (f)	112	5,175	8,911	73	428
Step 4: Matched with alternative spelling (g)	15	382	324	0	565
Total matched (e+f+g)	25,803	17,348	48,178	666	35,042
Not matched, share of 2001 ((a-b-e-f-g)/(a-b))	2%	4%	2%	9%	10%

Notes: Results of Steps1-4 of the procedure for matching the 2001 and the 2011 Census using village names. See the text for descriptions of each step.

II. Matching 2001 sub-districts to electoral constituencies. Of the 854 constituencies that were not redistricted and held elections in both 2008 and 2013, we have constituency boundary files for 850. The 2001 Census boundary files allowed us to match 723 of these to sub-districts in the Census. Delhi is responsible for most of the attrition during the matching: we lose all 70 constituencies in this state. In the 5 remaining states, we lose 21 constituencies in Karnataka, 12 in Madhya Pradesh, 27 in Mizoram, and 1 in Rajasthan (no constituencies are lost in Chhattisgarh). As shown below, our estimates and counterfactual results are robust to dropping Mizoram altogether.

Of the 723 matched constituencies, 71.9% (520) are affected by NOTA in 2013. In the full 854-constituency panel the corresponding figure is 73.8% (630 constituencies). The location of the matched constituencies is shown on Figure 3.

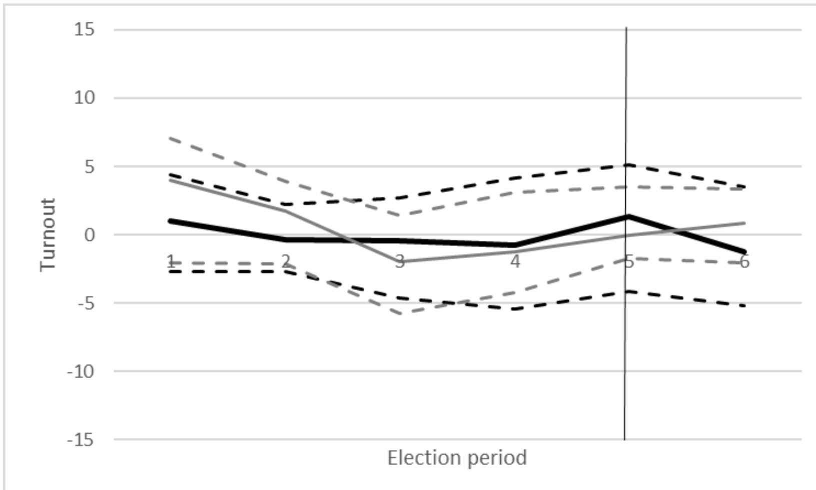
Figure 3: Constituencies in the merged dataset



1.2 Comparison of "control" and "treatment" states

For the reduced-form analysis to identify the causal effect of NOTA, turnout in the "treated" and "control" states must have parallel trends. Because data on the full set of variables used in the analysis is only available for two elections for each state, providing evidence on this assumption is difficult. To provide at least some suggestive comparisons, we obtained state-level turnout data for all states going back to at least 1980. On Figure 4 we plot average turnout separately for the control and the treatment states, controlling for state and year fixed effects. While these comparisons are at most suggestive, there does not seem to be large differences in the evolution of turnout just before the introduction of NOTA in the two groups of states.

Figure 4: The evolution of turnout in the control and treatment states before and after NOTA



Notes: Residuals from a regression of turnout on state and year fixed effects, averaged across the 16 control states (solid black line) and the 9 treatment states (solid grey line) by election period. On the horizontal axis, election period 6 is, for each state, the last election observed in the sample used in the analysis, lower numbers correspond to preceding elections. Elections in "period 1" took place in the 1980s. For the treatment states, the last election period (period 6) featured the NOTA option. Dotted lines denote the 15th and 85th percentile for the corresponding group (control or treated).

Next, Table 2 and 3 compare treatment and control states before the introduction of NOTA. Table 2 presents summary statistics separately for each state in the panel dataset. Karnataka is the "control" state unaffected by NOTA, the other states are "treatment" states, where NOTA was available in 2013 but not in 2008. Summary statistics are for 2008 (before NOTA). In the last column, comparing the treated states to the control state does not reveal large differences before the introduction of NOTA (we find 1 significant p-value out of 13 variables). In the structural exercise below, we will repeat the analysis excluding the state of Mizoram, which does appear to be an outlier on several dimensions.

Table 3 compares control and treatment states the extended dataset. For each state, values are for the first election in the sample (which took place before the introduction of NOTA for every state). We again do not see a large difference between the two groups: 1 significant p-value at 5% and an additional 2 at 10%. None of the electoral variables are significantly different.

Table 2: Characteristics of states in the panel dataset

	Control	Treatment					p-value
	Karnataka	Chhattisgarh	Madhya Pradesh	Mizoram	Rajasthan	All	for equality
Constituency characteristics							
Number of eligible voters (1000)	174.993	169.080	156.154	15.148	181.134	164.426	0.75
Turnout	0.683	0.706	0.705	0.830	0.666	0.693	0.64
Election closeness	0.100	0.089	0.099	0.065	0.089	0.093	0.17
Reserved constituency	0.241	0.433	0.376	1.000	0.296	0.371	0.18
State characteristics							
Number of constituencies	203	90	218	13	199	130.000	0.27
Labor force participation	0.661	0.746	0.648	0.678	0.601	0.668	0.85
Unemployment rate	0.013	0.007	0.011	0.025	0.019	0.015	0.57
Household earnings (real Rp/week)	1547.857	863.851	914.498	1875.160	1274.700	1232.052	0.31
Fraction illiterate	0.356	0.398	0.398	0.039	0.523	0.340	0.90
Fraction primary school or less	0.206	0.307	0.284	0.361	0.174	0.282	0.18
State NDP growth rate	11.284	6.251	2.923	8.207	2.718	5.025	0.02
Sex ratio	1001.416	990.720	936.186	1009.557	1002.068	984.633	0.43
Fraction urban	0.335	0.167	0.258	0.465	0.257	0.287	0.54

Notes: Characteristics of each state in the panel dataset in 2008 (before NOTA was available). Karnataka is the "control" state that does not have NOTA in 2013. For constituency-level variables the values shown are averages within each state. The p-value for the equality of means test in the last column is from OLS regressions of each variable on a "treatment" indicator. For constituency-level variables we obtained the p-values through a bootstrap clustered by state.

Table 3: "Control" and "treatment" states before NOTA in the extended dataset

	Control	Treatment	p-value for equality
Constituency characteristics			
Number of eligible voters (1000)	165.956	180.764	0.67
	(24,851.583)	(24,811.278)	
Turnout	0.691	0.655	0.51
	(0.049)	(0.020)	
Election closeness	0.104	0.103	0.91
	(0.010)	(0.005)	
Reserved constituency	0.262	0.293	0.58
	(0.033)	(0.048)	
State characteristics			
Number of constituencies	135.313	130.667	0.91
	(26.540)	(28.628)	
Labor force participation	0.591	0.592	0.97
	(0.016)	(0.030)	
Unemployment rate	0.049	0.022	0.02
	(0.010)	(0.003)	
Household earnings (real Rp/week)	1,410.241	1,610.451	0.36
	(108.754)	(188.210)	
Fraction illiterate	0.251	0.327	0.21
	(0.027)	(0.052)	
Fraction primary school or less	0.260	0.215	0.23
	(0.024)	(0.028)	
State NDP growth rate	7.663	3.832	0.08
	(1.456)	(1.487)	
Sex ratio	997.418	942.847	0.06
	(15.913)	(22.701)	
Fraction urban	0.288	0.357	0.43
	(0.035)	(0.079)	
Constituencies	2165	1176	
States	16	9	

Notes: Average characteristics with standard errors in parentheses of the control and treatment states before NOTA was available. For each state, values included are for the first election in the sample. The p-value for the equality of means test in the last column is from OLS regressions of each variable on a "treatment" indicator. For constituency-level variables we obtained the p-values allowing for clustering by state.

2 Patterns in the data: details

2.1 The correlates of NOTA votes

In this section we investigate the correlation between NOTA votes and constituency characteristics. We use the same dataset as in the structural analysis and run simple cross-sectional regressions on the 520 constituencies that are affected by the NOTA policy in 2013. We include state fixed effects and, to avoid confounding our estimates by differential turnout across constituencies, we measure NOTA vote shares as a fraction of total votes cast.[3]

The results are in Table 4. We find substantial heterogeneity in NOTA votes across constituencies. For example, the NOTA vote share is significantly higher in reserved constituencies and in constituencies with more illiterate voters, more women, more ST, and a lower share of rural workers. Each of these patterns is consistent with a variety of possible explanations. One possible interpretation is that NOTA votes are higher in more economically disadvantaged populations, reflecting a general dissatisfaction with elected leaders in these constituencies. Note however that the coefficients remain unchanged if we add controls for various indicators of infrastructure and economic activity in column (2). Another possible interpretation is that NOTA votes come from politically underrepresented voters, such as women, and non-SC or ST voters in reserved constituencies.

In columns (3) and (4) we add candidate characteristics to the regression. We find that constituencies with more candidates running have lower NOTA vote shares, which is consistent with NOTA reflecting dissatisfaction with the menu of candidates being offered. We do not find evidence that the presence of female, SC or ST candidates is correlated with NOTA votes.

[3]Using NOTA votes as a share of eligible voters yields very similar results.

Table 4: The correlates of NOTA votes

	(1)	(2)	(3)	(4)
Constituency characteristics:				
Reserved SC	0.005***	0.005***	0.002**	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
Reserved ST	0.011***	0.011***	0.009***	0.009***
	(0.002)	(0.001)	(0.002)	(0.002)
Literacy	-0.021***	-0.035***	-0.015**	-0.026**
	(0.006)	(0.010)	(0.006)	(0.010)
Size	-0.006*	-0.008**	-0.003	-0.005
	(0.003)	(0.004)	(0.003)	(0.004)
Fraction male	-0.215***	-0.230***	-0.133***	-0.190***
	(0.031)	(0.046)	(0.033)	(0.043)
Fraction SC	0.002	0.010	-0.006	0.006
	(0.008)	(0.009)	(0.007)	(0.008)
Fraction ST	0.010***	0.008*	0.010**	0.007
	(0.004)	(0.004)	(0.004)	(0.004)
No latrine		0.002		0.004
		(0.004)		(0.004)
Water nearby		0.016**		0.014**
		(0.006)		(0.006)
Water at home		0.011*		0.013**
		(0.006)		(0.005)
Fraction employed		0.015		-0.004
		(0.011)		(0.011)
Rural workers		-0.019***		-0.015***
		(0.005)		(0.005)
Car ownership		0.023		0.020
		(0.037)		(0.034)
Computer ownership		-0.029		0.036
		(0.057)		(0.052)
Phone ownership		-0.009		-0.010*
		(0.006)		(0.005)
TV ownership		-0.003		-0.007
		(0.006)		(0.006)
Candidate characteristics:				
Number of candidates			-0.001***	-0.001***
			(0.000)	(0.000)
No female			-0.001	-0.001
			(0.001)	(0.001)
<15% female			-0.000	-0.000
			(0.001)	(0.001)
Median age			-0.000	-0.000
			(0.000)	(0.000)
No SC			0.000	-0.000
			(0.001)	(0.001)
<15% SC			-0.000	0.000
			(0.001)	(0.001)
No ST			-0.000	-0.000
			(0.001)	(0.001)
<10% ST			0.002	0.001
			(0.001)	(0.002)
R^2	0.57	0.60	0.63	0.66
N	520	520	520	520

Notes: The dependent variable is the share of NOTA votes among all votes cast. Regressions at the constituency level for the cross-section of constituencies affected by the NOTA policy in 2013 in the panel dataset. All regressions include state fixed effects. Robust standard errors in parentheses. ***, **, and * indicates significance at 1, 5, and 10 percent, respectively.

2.2 Robustness of the regression estimates

This section explores the robustness of the regression estimates presented in section 4.2 of the paper for the extended dataset.

2.2.1 Randomization inference

The reduced form results presented in the main text suggest that the NOTA policy increased turnout. As discussed there, our ability to conduct inference is fundamentally limited by the number of states and time periods. In the paper, we attempt to remedy this by reporting bootstrapped standard errors, and find that these lead to similar inference as standard errors obtained with the asymptotic cluster-robust formula. We now check if the inference that NOTA increased turnout can be supported further by conducting randomization inference tests (see McKinnon and Webb (2018) for a recent analysis of randomization inference in the panel data context).

We replicate the "experiment" involving the timing of the Supreme Court's decision with respect to the states' electoral calendar by allowing every combination of states to serve as a potential treatment or control group. For every artificial treatment assignment, we select 9 of the 25 states as the treatment group (the same number as in the true treatment group). Each of these states is assigned the NOTA policy between its first and second election, while the other 16 states are assumed not to have NOTA in either election. For each treatment assignment, we run specification (2) in Table 4 in the paper and collect the t-statistics of the estimated treatment effects. We obtain the p-value of the true treatment effect based on the rank of the true t-statistic in this distribution.

First, we consider all possible treatment assignments with 9 treatment and 16 control states (2,042,975 possible combinations). To obtain the (approximate) p-value, we estimate treatment effects as described above for 1000 randomly chosen assignments from this set. This yields a p-value of 0.069 for the null of no treatment effect against the one-sided alternative of a positive treatment effect, while the p-value against the two-sided alternative is 0.14.

One issue with this procedure is that, since states differ in the number of constituencies, the number of units (constituencies) in the artificial treatment assignments can differ considerably from the true treatment assignment. To achieve assignments more comparable to the actual one, we restrict the set of possible treatment assignments by considering only assignments where the total number of treated constituencies is within +/- 20% of the true number of treated constituencies (1176). This yields 1,374,186 possible assignments, and we again obtain an approximate p-value from 1000 randomly chosen assignments from this set. This yields a p-value of 0.027 (one-sided) and 0.074 (two-sided) for the estimated treatment effect. Sampling from assignments within 10% (5%) of the true number of treated constituencies yields a one-sided p-value of 0.031 (0.021) and a two-sided p-value of 0.080 (0.064).

2.2.2 National elections

In our study period, Indian national elections took place in Spring 2009 and 2014. Recall that we do not include in the analysis the four states that hold their assembly elections simultaneously with the national election. Nevertheless, other states holding elections in a national election year could potentially also see an impact from national events in that year, like the wave of support for the BJP in the 2014 national elections. This has the potential to confound our estimates of the NOTA policy introduced between the two national elections in September 2013.[4]

To check for this, in Table 5 we exclude the national election years from the sample. Columns (1) and (2) exclude 2014 and columns (3) and (4) exclude both 2009 and 2014. Odd numbered columns correspond to the specification in column (2) of Table 4 in the paper with the basic controls and even numbered columns to column (3) with the extended controls. We find that all point estimates are similar to, and if anything slightly larger than the 3 percentage points effect we found in the paper. National elections do not appear to confound the estimates reported in the main text.

2.2.3 Redistricting

Another potential confound is the electoral redistricting that took place in April 2008. Because elections are held every 5 years and NOTA was introduced in September 2013, none of the states that were affected by NOTA in our period of study were redistricted, while most states that were not affected by NOTA were redistricted. Thus, redistricting has the potential to confound our estimates of NOTA.[5]

To control for this, we create a constituency-level measure of redistricting by using GIS boundary files to compare constituencies before and after the delimitation. Our first measure calculates for each current constituency that was redistricted in our study period the largest area that was part of a single constituency before the redistricting. For example, a value of

[4] Because split-ticket voting (constituencies voting for different parties at the state and national levels) is common in India, it is ex ante not obvious that events affecting national turnout would affect assembly elections. Note also that increased support for the BJP would presumably lead to more BJP votes rather than NOTA votes, so this is unlikely to explain the turnout effects from NOTA.

[5] For example, if redistricting lowered turnout, our estimate of NOTA's effect of turnout would likely be biased upward.

Table 5: Effect of NOTA on turnout, excluding national election years

	(1)	(2)	(3)	(4)
NOTA	0.033**	0.033**	0.030*	0.031*
	(0.015)	(0.016)	(0.015)	(0.015)
Basic controls	x		x	
Extended controls		x		x
Excluded years	2014	2014	2009, 2014	2009, 2014
R^2	0.18	0.20	0.19	0.21
N	6139	6139	5680	5680
States	25	25	22	22

Notes: Estimates of the effect of the NOTA policy on turnout using the repeated cross section sample with specific years excluded. All regressions control for state and year fixed effects, the log number of eligible voters in a constituency and its square, and the following state-level variables: labor force participation, real weekly household earnings, fraction of illiterates, fraction with primary school or less as highest education. The Extended controls specification also controls for reserved constituencies and the following state level variables: unemployment, sex ratio, fraction urban, and the growth rate of net domestic state product. Standard errors clustered by state in parentheses. ***, **, and * indicate significance at 1, 5, and 10 percent, respectively.

0.8 for this "maximum overlap" measure indicates that 80% of the current constituency's area was part of a single constituency pre-delimitation (while the remaining 20% was part of one or more different constituencies). The higher the maximum overlap, the less a constituency was affected by redistricting. Our second measure, rather than focus on the largest area of overlap, uses each overlapping area to create an index of "territorial fractionalization." If a constituency overlaps with n pre-delimitation constituencies with $a_1, ..., a_n$ denoting the share of its area falling in each of these, then the fractionalization index is $1 - \sum_{i=1}^{n} a_i^2$. The larger this value, the more the current constituency was affected by redistricting. Both of these measures are available for 22 states (constituency boundary files are not available for the states of Assam, Manipur, and Nagaland).

Table 6 presents regressions corresponding to Table 4 in the paper controlling for these measures of redistricting. The first two columns repeat columns (2) and (3) in Table 4 in the paper on the 22 states with available redistricting measures. Columns (3) and (4) then add the maximum overlap measure and columns (5) and (6) the territorial fractionalization index. As can be seen, adding either measure of redistricting to the regressions causes little change in the estimated effect of NOTA. The estimates also retain their significance, except for column (6) where the standard error increases just enough to yield a p-value of 0.106.[6]

[6] The coefficients on the redistricting measures are never statistically significant.

Table 6: Effect of NOTA on turnout, controlling for redistricting

	(1)	(2)	(3)	(4)	(5)	(6)
NOTA	0.033**	0.021*	0.030**	0.019*	0.030**	0.019
	(0.015)	(0.011)	(0.014)	(0.011)	(0.014)	(0.011)
Control for redistricting	none	none	maxo	maxo	fract	fract
Basic controls	x		x		x	
Extended controls		x		x		x
R^2	0.20	0.21	0.20	0.21	0.20	0.21
N	6171	6171	6171	6171	6171	6171
States	22	22	22	22	22	22

Notes: Estimates of the effect of the NOTA policy on turnout using the repeated cross section sample. Columns (1) and (2) are run on the states with available constituency boundary files. Columns (3) and (4) control for redistricting using the maximum overlap measure and columns (5) and (6) using the territorial fractionalization index. All regressions control for state and year fixed effects, the log number of eligible voters in a constituency and its square, and the following state-level variables: labor force participation, real weekly household earnings, fraction of illiterates, fraction with primary school or less as highest education. Even-numbered columns also control for reserved constituencies and the following state level variables: unemployment, sex ratio, fraction urban, and the growth rate of net domestic state product. Standard errors clustered by state in parentheses. ***, **, and * indicate significance at 1, 5, and 10 percent, respectively.

2.2.4 State-specific events

Turning to state-specific events that may confound our estimates, we identified four states where various events may plausibly affect 2013 or 2014 turnout relative to the previous election (that is, turnout in the with-NOTA election relative to turnout in the without-NOTA election). In Chhattisgarh, Maoist insurgents conducted terrorist attacks in 2010 and May 2013, between the 2008 and 2013 elections in this state. In Jammu & Kashmir, various incidents occurred between its 2008 and 2014 elections, including a border skirmish in January 2013 between India and Pakistan described by observers as one of the worst in 10 years. In Delhi, a new anti-corruption party, Aam Aadmi entered politics in 2012, energized voters, and emerged as the second-largest party in the 2013 assembly election. Finally, Maharashtra held its 2009 election a year after the 2008 terrorist attacks in Mumbai on several hotels and public buildings, and security concerns may have depressed voter turnout there.

In Table 7, we repeat the specifications from Table 4 in the paper excluding each of these states one at a time and then all four of them. The results corresponding to the first specification are in column (1) and column (2) corresponds to the second specification with the extended set of controls. All these coefficients are close to the 3 percentage point effect found in the paper. The events in these four states do not appear to drive the estimated effect of NOTA on turnout reported in the main text.

While we did not find specific events in other states that may have affected turnout and

Table 7: Effect of NOTA on turnout, robustness to state-specific events

Excluded state	Effect of NOTA		N
	Basic controls	Extended controls	
Chhattisgarh	0.025*	0.035	6505
	(0.014)	(0.021)	
Maharashtra	0.031**	0.031*	6109
	(0.015)	(0.015)	
Delhi	0.029**	0.031*	6545
	(0.013)	(0.016)	
Jammu and Kashmir	0.030**	0.031*	6511
	(0.014)	(0.016)	
All four	0.028*	0.039*	5615
	(0.015)	(0.019)	

Notes: Estimates of the effect of the NOTA policy on turnout using the repeated cross section sample with specific states excluded. All regressions control for state and year fixed effects, the log number of eligible voters in a constituency and its square, and the following state-level variables: labor force participation, real weekly household earnings, fraction of illiterates, fraction with primary school or less as highest education. The Extended controls specification also controls for reserved constituencies and the following state level variables: unemployment, sex ratio, fraction urban, and the growth rate of net domestic state product. Standard errors clustered by state in parentheses. ***, **, and * indicate significance at 1, 5, and 10 percent, respectively.

whose timing coincided with NOTA, we may not have found all such events. To allow for this, we ran regressions excluding each state one at a time. The distribution of the resulting parameter estimates and p-values is shown in Table 8. The 3 percentage point effect found in the main text turns out to equal both the mean and the median of the distribution of coefficients in these regressions. Of these coefficients, 88% are statistically significant at the 10 percent level and 68% are significant at the 5 percent level.

Table 8: Effect of NOTA on turnout: distribution of coefficients and p-values dropping one state at a time

NOTA coefficients	
Mean	0.030
Median	0.030
10th percentile	0.024
90th percentile	0.032
fraction $p < 0.05$	0.680
fraction $0.05 < p < 0.10$	0.200
fraction $0.10 < p < 0.19$	0.120

Notes: Estimates of the effect of the NOTA policy on turnout using the repeated cross section sample with basic controls, excluding one state at a time (25 regressions).

2.2.5 Voting costs

In this section we include further controls in the difference-in-differences specification in an attempt to control for any time-varying differences in voting costs across constituencies. First we obtained data from the Election Commission on the day of the week that the elections in each constituency were held. We create a dummy for wether the election was held on a weekend, as this might affect the cost of turnout. Constituencies within a state typically go to the polls in groups over a period of 2-3 days, so this variable varies at the constituency-year level. In column (1) and (2) of Table 9 we find that controlling for the Weekend dummy has no impact on our results.

Second, we include rainfall information on each election day. Several studies document that bad weather can raise the cost of turnout. Columns (3) and (4) in Table 9 show that our estimates of the impact of NOTA are robust to controlling for rainfall. Columns (5) and (6) include both the weekend indicator and rainfall and yield similar results.

Third, we obtained data on the number of voting stations in each constituency. We divide this by the number of eligible voters in order to proxy for the convenience of voting. For example, a low number of voting stations per voters may lead to long wait times at the voting booth and discourage some people from voting. We include this variable as a control in columns (7) and (8) of Table 9. These estimates should be interpreted with care since the number of voting stations could be endogenous for a number of reasons (for example, areas with historically high turnout may receive more stations). Nevertheless, it is reassuring that controlling for differences in voting costs as proxied by the number of stations per voter actually reinforces our findings. Columns (9) and (10) show the corresponding estimates when we instead divide the number of stations with the number of eligible voters.

2.2.6 Ballot placement

NOTA introduced a new option on the voting machines. Moreover, it was assigned the last button on the machines, below all the regular candidates (see Figure 1). While we are not aware of previous analyses of being placed *last*, studies have shown that ballot placement more generally can affect voter choices (at least in the case of paper ballots: see, e.g., Ho and Imai (2006) and Shue and Luttmer (2009)). Could the introduction of NOTA have such an impact on voters? Clearly, this would not explain the increase in turnout which we find most NOTA votes are coming from. It could, however, account for some of the substitution away from candidates that we find in the structural model.

Table 9: Effect of NOTA on turnout with controls for voting costs

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
NOTA	0.028*	0.030*	0.024*	0.025*	0.024*	0.025*	0.051***	0.052**	0.059***	0.061***
	(0.015)	(0.016)	(0.013)	(0.014)	(0.014)	(0.015)	(0.015)	(0.019)	(0.014)	(0.019)
Weekend	-0.003	-0.008			-0.003	-0.007				
	(0.009)	(0.009)			(0.009)	(0.009)				
Rainfall			0.032	0.033	0.032	0.032				
			(0.022)	(0.024)	(0.022)	(0.024)				
Stations / voters							79.791**	86.529***		
							(30.391)	(30.277)		
Voters / stations									-0.020***	-0.021***
									(0.006)	(0.006)
Basic controls	x		x		x		x		x	
Extended controls		x		x		x		x		x
R^2	0.18	0.19	0.18	0.20	0.18	0.20	0.20	0.22	0.23	0.25
N	6,685	6,685	6,684	6,684	6,684	6,684	6,676	6,676	6,676	6,676
States	25	25	25	25	25	25	25	25	25	25

Notes: Estimates of the effect of the NOTA policy on turnout using the repeated cross section sample with additional controls. Weekend is a dummy equal to 1 for elections held on a weekend. Rainfall is rainfall on election day in cm. Voting stations is the number of voting stations per eligible voters. All regressions control for state and year fixed effects, the log number of eligible voters in a constituency and its square, and the following state-level variables: labor force participation, real weekly household earnings, fraction of illiterates, fraction with primary school or less as highest education. The Extended controls specification also controls for reserved constituencies and the following state level variables: unemployment, sex ratio, fraction urban, and the growth rate of net domestic state product. Standard errors clustered by state in parentheses. ***, **, and * indicate significance at 1, 5, and 10 percent, respectively.

While it is difficult to rule this out completely, we can check whether introducing NOTA resulted in a decline in the vote share of the candidate listed last on the machine (i.e., listed last before the NOTA policy and just above the NOTA option once NOTA was introduced). It is possible to do this because the Election Commission regulates the placement of candidates on the machines.[7] Table 10 columns (1) and (2) run our main specification using as dependent variable the vote share of the candidate listed last (or immediately above NOTA). The results suggest that NOTA did not have a significant impact on this candidate's vote share, although the estimated coefficients are negative. Of course, we would also find a negative effect if voters substitute to NOTA deliberately (not because of ballot placement). To conduct a sharper test, we take the difference between the vote share of the candidate ranked before last and the vote share of the candidate ranked last. If voters disproportionately substituted to NOTA from the last candidate, then we would expect to find significant positive coefficients on NOTA. Columns (3) and (4) of Table 10 show that this is not the case, suggesting that ballot placement effects from NOTA may not be quantitatively important.

Table 10: NOTA and ballot order

Dep. Var:	Last candidate		Last cand. minus penultimate cand.	
	(1)	(2)	(3)	(4)
NOTA	-0.024	-0.005	0.006	-0.022
	(0.020)	(0.018)	(0.018)	(0.024)
Basic controls	x		x	
Extended controls		x		x
R^2	0.01	0.02	0.00	0.00
N	6685	6685	6685	6685

Notes: Estimates of the effect of the NOTA policy on the vote share of the candidate listed last using the repeated cross section sample. The dependent variable is the vote share of the last candidate (sample mean = 0.054, s.d. = 0.120) in columns (1-2) and the difference between the penultimate and the last candidate's vote share (sample mean = 0.019, s.d. = 0.159) in columns (3-4). All regressions control for state and year fixed effects and the following state-level variables: labor force participation, real weekly household earnings, fraction of illiterates, fraction with primary school or less as highest education. The Extended controls specification also controls for reserved constituencies and the following state level variables: unemployment, sex ratio, fraction urban, and the growth rate of net domestic state product. Standard errors clustered by state in parentheses. ***, **, and * indicate significance at 1, 5, and 10 percent, respectively.

[7] See http://eci.nic.in/eci_main/ElectoralLaws/HandBooks/Handbook_for_Candidates.pdf, p42-43. Candidates are first ordered by party type (national, state, unrecognized, or independent) and then alphabetically, excluding first initials and titles. Using these rules, we replicated the ordering of candidates based on the candidate names available in the Election Commission database.

2.2.7 Voter registration

Changes in voter registration could impact our findings in two ways. First, it could be that some of the new turnout is due to voters deciding to register and vote after the introduction of NOTA. Since voters failing to register is a form of abstention, this would mean that we are underestimating the impact of NOTA on voter participation.[8]

Second, it could be that voter registration lists contain mistakes (e.g., voters who moved or died may incorrectly appear on the list). If such mistakes exist and if the introduction of NOTA was accompanied by increased efforts to fix them, this could yield a reduction in the number of registered voters and show up as increased turnout in our regressions. In Table 11 we use the number of eligible voters as a dependent variable and find insignificant positive coefficients. There is no evidence that NOTA affected the number of registered voters, and especially that it did so in a negative way.

Table 11: NOTA and voter registration

Dep. Var:	Log(eligible voters)	
	(1)	(2)
NOTA	0.069	0.077
	(0.050)	(0.047)
Basic controls	x	
Extended controls		x
R^2	0.10	0.10
N	6685	6685

Notes: Estimates of the effect of NOTA on the number of registered voters (in logs) using the repeated cross section sample. Sample mean of dep. var. = 11.917, s.d. = 0.734. All regressions control for state and year fixed effects and the following state-level variables: labor force participation, real weekly household earnings, fraction of illiterates, fraction with primary school or less as highest education. The Extended controls specification also controls for reserved constituencies and the following state level variables: unemployment, sex ratio, fraction urban, and the growth rate of net domestic state product. Standard errors clustered by state in parentheses. ***, **, and * indicate significance at 1, 5, and 10 percent, respectively.

[8]For example, suppose there are E eligible voters, R of whom registered, and V of whom voted. Suppose that after NOTA, the $(E - R)$ previously unregistered voters register and vote, and total turnout is $V' = V + (E - R)$. Then our estimated effect of NOTA would be $V'/E - V/R$ while the true effect is $V'/E - V/E$, which is larger.

2.3 NOTA and election closeness

In the structural analysis, election closeness affects voter behavior only through the popularity shocks ξ_{jc}. In the counterfactual analysis, we assume that these shocks are independent of whether or not a NOTA option is available. Here we explore the validity of this assumption by investigating whether the presence of NOTA is correlated with ex post election closeness in the reduced form. In Table 12 we present regressions on three different measures of closeness: the difference in the vote shares of the two frontrunners (columns (1) and (2)), the difference in the number of votes received by the two frontrunners (columns (3) and (4)), and the difference in the log number of votes received by the two frontrunners (columns (5) and (6)). The presence of the NOTA option is not associated with significantly closer elections using any of these measures.

Table 12: Effect of NOTA on election closeness

Dep. Var:	Vote share difference		Vote count difference		Log vote count difference	
	(1)	(2)	(3)	(4)	(5)	(6)
NOTA	-0.001	-0.019	70.1	-3072.2	-0.020	-0.065
	(0.011)	(0.019)	(2052.0)	(2945.9)	(0.030)	(0.048)
Basic controls	x		x		x	
Extended controls		x		x		x
R^2	0.01	0.02	0.11	0.12	0.01	0.01
N	6685	6685	6685	6685	6685	6685
States	25	25	25	25	25	25

Notes: Estimates of the effect of the NOTA policy on election closeness using the repeated cross section sample. Election closeness between the two frontrunners is measured as the difference in vote shares in columns (1) and (2), as the difference in the number of votes received in columns (3) and (4), and as the difference in the log number of votes received in columns (5) and (6). All regressions control for state and year fixed effects, the log number of eligible voters in a constituency and its square, and the following state-level variables: labor force participation, real weekly household earnings, fraction of illiterates, fraction with primary school or less as highest education. The Extended controls specification also controls for reserved constituencies and the following state level variables: unemployment, sex ratio, fraction urban, and the growth rate of net domestic state product. Standard errors clustered by state in parentheses. ***, **, and * indicate significance at 1, 5, and 10 percent, respectively.

3 Further details for the BLP model

3.1 Aggregation, instruments

Table 13 shows summary statistics before and after the aggregation of Independent and Small party candidates as described in the paper. Here, "small parties" are parties fielding candidates in less then 1/3 of the constituencies in a given state. Tables 14 and 15 present corresponding figures for two alternative definitions of this category, using thresholds of 1/2 and 1/4, respectively.

Table 16 presents detailed summary statistics of the instrumental variables used in the different BLP specifications. Table 17 estimates linear (Logit) specifications for the 3 instrument sets and reports "first stage" F statistics.

Table 13: Aggregating Independent and Small party candidates

Variable	N	Mean	Std. Dev.	10%	90%
Before aggregation					
Number of candidates	1446	11.370	4.909	6	17
Number of independents	1446	4.667	3.729	1	9
Number of small-party candidates	1446	2.014	1.763	0	4
Vote share of independents	6748	0.018	0.048	0.002	0.027
Vote share of small-party candidates	2912	0.018	0.045	0.002	0.029
After aggregation					
Number of candidates	1446	6.439	1.403	5	8
Vote share of independents	1354	0.090	0.115	0.015	0.252
Vote share of small-party candidates	1176	0.021	0.053	0.002	0.034

Notes: Candidate counts are for the 1446 constituencies in the data and exclude the NOTA option. Vote shares are for all independent/small party candidates. Independent candidates are not affiliated with any party. Small parties are parties fielding candidates in less than 1/3 of the constituencies in a state. For each of these categories we aggregate candidates in a constituency as described in the paper.

Table 14: Aggregating Independent and Small party candidates (small party threshold: 1/2)

Variable	N	Mean	Std. Dev.	10%	90%
Before aggregation					
Number of candidates	1446	11.370	4.909	6	17
Number of independents	1446	4.667	3.729	1	9
Number of small-party candidates	1446	2.385	1.970	0	5
Vote share of independents	6748	0.018	0.048	0.002	0.027
Vote share of small party candidates	3448	0.018	0.044	0.002	0.030
After aggregation					
Number of candidates	1446	6.101	1.233	5	8
Vote share of independents	1354	0.090	0.115	0.015	0.252
Vote share of small party candidates	1223	0.020	0.050	0.002	0.032

Notes: Candidate counts are for the 1446 constituencies in the data and exclude the NOTA option. Vote shares are for all independent/small party candidates. Independent candidates are not affiliated with any party. Small parties are parties fielding candidates in less than 1/2 of the constituencies in a state. For each of these categories we aggregate candidates in a constituency as described in the paper.

Table 15: Aggregating Independent and Small party candidates (small party threshold: 1/4)

Variable	N	Mean	Std. Dev.	10%	90%
Before aggregation					
Number of candidates	1446	11.370	4.909	6	17
Number of independents	1446	4.667	3.729	1	9
Number of small-party candidates	1446	1.569	1.554	0	4
Vote share of independents	6748	0.018	0.048	0.002	0.027
Vote share of small party candidates	2269	0.017	0.046	0.002	0.027
After aggregation					
Number of candidates	1446	6.804	1.482	5	9
Vote share of independents	1354	0.090	0.115	0.015	0.252
Vote share of small party candidates	1061	0.020	0.049	0.002	0.032

Notes: Candidate counts are for the 1446 constituencies in the data and exclude the NOTA option. Vote shares are for all independent/small party candidates. Independent candidates are not affiliated with any party. Small parties are parties fielding candidates in less than 1/4 of the constituencies in a state. For each of these categories we aggregate candidates in a constituency as described in the paper.

Table 16: Summary statistics of the instruments

Instrument	N	Mean	Std. Dev.	10%	90%
Regular candidates					
Gender in other constituencies 2008	9311	0.076	0.021	0.048	0.104
Gender in other constituencies 2013	9311	0.079	0.022	0.049	0.096
Age in other constituencies 2008	9311	0.453	0.021	0.422	0.474
Age in other constituencies 2013	9311	0.462	0.012	0.447	0.473
Minority in other constituencies 2008	9311	0.395	0.103	0.289	0.524
Minority in other constituencies 2013	9311	0.408	0.087	0.340	0.518
NOTA					
Minority population	520	0.385	0.194	0.207	0.720
Literacy	520	0.567	0.090	0.468	0.670
Rural workers	520	0.683	0.164	0.463	0.857
State 1 (Karnataka)					
Own party's gender	2814	0.048	0.012	0.035	0.067
Own party's age	2814	0.473	0.040	0.426	0.526
Own party's minority	2814	0.317	0.100	0.250	0.435
State 2 (Madhya Pradesh)					
Own party's gender	2889	0.089	0.021	0.062	0.116
Own party's age	2889	0.440	0.036	0.397	0.492
Own party's minority	2889	0.441	0.083	0.358	0.558
State 3 (Mizoram)					
Own party's gender	98	0.020	0.039	0.000	0.100
Own party's age	98	0.493	0.033	0.442	0.537
State 4 (Rajasthan)					
Own party's gender	2301	0.089	0.037	0.047	0.131
Own party's age	2301	0.469	0.043	0.412	0.530
Own party's minority	2301	0.368	0.063	0.313	0.440
State 5 (Chhattisgarh)					
Own party's gender	1209	0.101	0.048	0.051	0.170
Own party's age	1209	0.433	0.039	0.402	0.497
Own party's minority	1209	0.526	0.109	0.415	0.639

Notes: Gender in other constituencies 2008 is the average gender of all candidates in other constituencies in the state in the 2008 election. Variables for other elections and candidate characteristics are constructed similarly for the 9311 non-NOTA candidates. The NOTA indicator is interacted with 3 average demographics of the constituency (minority pop., literacy, rural workers). For each state and each characteristic (gender, age, and minority) an instrument is created by interacting the state indicator with the average of a party's candidates in other constituencies within the state in the given election. Summary statistics for these instruments are listed by state with the number of candidates for the state given under N. The State3*Minority variable is not created because all constituencies in state 3 (Mizoram) are reserved for minority candidates. In the estimation we use 3 different subsets of the listed instruments, see the paper for details.

Table 17: Logit IV estimates

Instrument set:	First	Second	Third
	(1)	(2)	(3)
Gender	0.805***	0.512**	0.289*
	(0.269)	(0.200)	(0.175)
Age	2.936**	3.313***	1.828***
	(1.174)	(0.857)	(0.664)
Minority	-4.177***	-1.382***	-0.930***
	(0.639)	(0.145)	(0.174)
NOTA	-4.683***	-3.798***	-3.653***
	(0.229)	(0.072)	(0.073)
Ran	0.287***	0.288***	0.297***
	(0.085)	(0.063)	(0.059)
Won	0.573***	0.630***	0.634***
	(0.076)	(0.067)	(0.064)
N	9831	9831	9831
Weak IV F stat	39.09	10.43	8.95
J	84.89	200.42	292.60
df	11	14	20
p-value	0.000	0.000	0.000

Notes: Two-step GMM estimates of the linear (Logit) model. All regressions include state, year, and party fixed effects, reservation status, broadcast allowance and rainfall. The Weak IV F statistic is the Kleibergen-Paap statistic computed by ivreg2 in Stata. Observations weighted by the number of eligible voters. Standard errors clustered by constituency in parentheses. ***, **, and * indicates significance at 1, 5, and 10 percent, respectively. N = 9831.

3.2 Simulating the voters

To compute the vote shares predicted by the model (equation (8) in the paper) we simulate individual voters as follows.

First, we match to each constituency the tehsils (or sub-districts) that it overlaps using the GIS boundary files for the electoral and the administrative divisions. We compute the fraction of the constituency's area that falls in each tehsil. The simplest approach would be to use tehsil-level demographics from the Census and take the area-weighted average of these for each constituency. The disadvantage of this approach is that it ignores the within-tehsil correlation of demographic variables (e.g., if rural villages also tend to be less literate). To preserve the correlation of demographics across villages, we instead proceed as follows.

In the census data, we compute the fraction of each tehsil's population in the various villages. For each simulated voter in a constituency, we first randomly pick a tehsil using the distribution of the constituency's area across tehsils. Next, for the chosen tehsil we randomly pick a village using the distribution of the tehsil's population across villages. Finally, from the chosen village we pick the voter's demographics using the village characteristics given in the Census. We repeat this procedure 1000 times for each constituency.

3.3 Algorithms and codes

We implement the BLP procedure in MATLAB using the Nested Fixed Point (NFP) algorithm proposed by BLP. As emphasized by Dube et al. (2012), implementing the procedure requires care in order to avoid numerical instability, local optima, and biased standard errors. In particular, Dube et al. (2012) show that inaccuracies in the computation of the mean utilities δ_{jc} in BLP's contraction mapping (see section 6.1 in the main text) can make the parameter estimates unreliable. This is especially the case for optimizers that use user-supplied derivatives because here the computed δ_{jc} enter *both* in the evaluation of the GMM objective function and its gradient.

Apart from following Dube et al.'s (2012) recommendation of using a tight convergence criterion for the contraction mapping (we use 10^{-12}), we took two additional steps in order to avoid these potential pitfalls.

First, we eliminated a source of numerical instability for applications with many markets in the typical codes used to compute market shares. Specifically, computing the market shares requires aggregating the utilities corresponding to the various options within a market (see the denominator of equation (5) in the paper). It is common to code this by first aggregating across all constituencies using the "cumsum" function, then taking differences for each constituency using the "diff" function. For example, with 3 markets and 5 possible options in each, the code would compute the sum for the 3rd market by summing over the 10 options in markets 1-2, then summing over all 15 options, and finally subtracting the former from the latter.[9] While this procedure is perfectly fine in many applications, with 1446 markets and 9831 options, aggregating across options quickly results in very large numbers, and MATLAB runs out of precision to accurately compute the small differences between these large numbers. To circumvent this, we use the more recent "accumarray" function, which allows aggregating each market separately and thus yields numerically precise market shares. Precision in the computed market shares is crucial for the precise computation of δ_{jc}.

Second, we use a derivative-free procedure for optimizing the GMM objective. While methods that allow for a user-specified gradient can be much faster, they are susceptible to error if the gradient is not computed precisely. As highlighted by Dube et al. (2012), any error in δ_{jc} is likely to be magnified when it shows up *both* in the objective function and its user-supplied gradient. To avoid this loss of precision at the cost of giving up speed, we use a derivative-free optimizer. We used the "patternsearch" algorithm, which performs a grid search without evaluating the GMM gradient.

For our preferred specification, upon which our counterfactual analysis is based, we verified that neither of the alternative optimizers "fminsearch" or "fminunc" could improve on the estimates, either holding the GMM weighting matrix constant (i.e., running the second step only) or re-running the entire estimation routine from the beginning. We also verified the "patternsearch" results using various starting values, including a set of randomly chosen starting values.[10]

3.4 Standard errors

Standard errors are computed using the standard formulas (e.g., Cameron and Trivedi, 2005, p194-195). Letting $\boldsymbol{\theta}^{Step2}$ denote the final vector of parameter estimates, we compute the derivatives of the GMM error term, $\mathbf{D} = \partial\tilde{\boldsymbol{\xi}}(\boldsymbol{\theta}^{Step2})/\partial\boldsymbol{\theta}$, and the (scaled) covariance matrix of the moment conditions, $\mathbf{S} = \sum_{c}^{C}\mathbf{Z}_c'\tilde{\boldsymbol{\xi}}_c(\boldsymbol{\theta}^{Step2})\tilde{\boldsymbol{\xi}}_c(\boldsymbol{\theta}^{Step2})'\mathbf{Z}_c$. The estimated covariance matrix

[9] All publicly available codes that we are aware of use this procedure when computing the market shares.

[10] An alternative to NFP used in the literature is mathematical programming with equilibrium constraints (MPEC) (see Dube et al. (2012)). This procedure uses the market share equations as constraints in the GMM program, and uses constrained optimization. With 9831 candidates, in our case the optimizer would need to handle 9831 constraints. Assuming an optimizer would be able to handle this many constraints, implementing it would require more extensive computing resources than we have access to. Given our careful implementation of NFP described above, it is unclear whether the gains from MPEC would exceed its costs in this particular case.

of the parameters is then

$$[\mathbf{D}'\mathbf{Z}\mathbf{W}^{-1}\mathbf{Z}'\mathbf{D}]^{-1}[\mathbf{D}'\mathbf{Z}\mathbf{W}^{-1}\mathbf{S}\mathbf{W}^{-1}\mathbf{Z}'\mathbf{D}][\mathbf{D}'\mathbf{Z}\mathbf{W}^{-1}\mathbf{Z}'\mathbf{D}]^{-1},$$

which yields standard errors robust to heteroskedasticity and constituency-level clustering.

4 Further specifications and counterfactual results

4.1 Random coefficients specifications

Table 18 presents estimation results for Normal random coefficients specifications using the second instrument set. In column (1) we include random coefficients on the candidate characteristics gender, age, minority, NOTA, as well as the utility of abstention (the constant). As can be seen, many of the linear parameters on the candidate characteristics are statistically significant, indicating that these variables are relevant determinants of average voter utility in a constituency over and above the party labels (since the mean utility always includes party fixed effects $\bar{\xi}_j$). Turning to the nonlinear parameters of the random coefficients, we see that the coefficients on gender and age are larger and statistically significant while for the other characteristics they are small and insignificant. This suggests the presence of significant heterogeneity in voter preferences for gender and age but not for other characteristics. In columns (2)-(4) we experiment with random coefficients on other candidate characteristics, including the party dummies, and always find similar results. For example, in column (4) we allow for random coefficients on the two largest parties, INC and BJP, as well as on independent candidates and the "Small party" category. The estimates for these coefficients are all close to 0. For these other characteristics, controlling for their mean valuation (together with all other candidate and constituency characteristics) appears to leave little individual heterogeneity for the model to explain.

In columns (5) and (6) we include the additional candidate characteristics education, criminal history, and assets (along with their missing-indicators as discussed in the text). These do not affect the above conclusions, in particular the random coefficients on candidate gender and age remain statistically significant.

Table 18 also shows that these Normal random coefficients specifications of the model are inadequate: the J-test always rejects the validity of these specifications.

Tables 19 and 20 present estimation results for random coefficients specifications using the first and third instrument set, respectively. The findings are broadly similar.

Table 18: Parameter estimates using Normally distributed random coefficients

	(1)	(2)	(3)	(4)	(5)	(6)
Linear parameters						
Gender	-2.264	-2.217	-2.263	0.517**	-1.787	-1.976
	(1.441)	(1.444)	(1.739)	(0.235)	(1.573)	(1.426)
Age	7.825***	7.814***	7.801**	3.759***	7.964***	5.119**
	(2.196)	(2.396)	(3.371)	(1.241)	(1.880)	(2.666)
Minority	-1.294	-1.287***	-1.287***	-1.332***	-1.185***	-1.211***
	(0.311)	(0.223)	(0.187)	(0.229)	(0.356)	(0.285)
Ran	0.146	0.156	0.147	0.285***	0.183	0.221**
	(0.107)	(0.413)	(0.117)	(0.071)	(0.132)	(0.120)
Won	0.555***	0.554***	0.556***	0.620***	0.501***	0.572***
	(0.119)	(0.127)	(0.154)	(0.088)	(0.109)	(0.118)
NOTA	-4.254***	-4.245***	-4.231***	-3.796	-4.108***	-3.964***
	(0.840)	(0.698)	(0.153)	(4.869)	(0.869)	(0.360)
Reserved SC	0.842***	0.836***	0.838***	1.113***	0.847***	0.996***
	(0.258)	(0.208)	(0.233)	(0.210)	(0.268)	(0.235)
Reserved ST	1.178***	1.172***	1.172***	1.382***	1.169***	1.233***
	(0.266)	(0.186)	(0.108)	(0.159)	(0.269)	(0.229)
Rainfall	-0.018	-0.019	-0.018	-0.037	-0.037	-0.033
	(0.066)	(0.065)	(0.071)	(0.040)	(0.073)	(0.082)
Broadcast	0.069	0.067	0.068	-0.059	0.058	0.032
	(0.162)	(0.200)	(0.174)	(0.105)	(0.152)	(0.164)
Education					0.405***	0.376***
					(0.095)	(0.098)
Crime					0.353***	0.366***
					(0.079)	(0.065)
Missing educ/crime					-0.011	0.028
					(1.565)	(0.123)
Assets						0.258
						(0.427)
Missing assets						0.261
						(1.829)

Cont'd on next page

Table 6 cont'd

	(1)	(2)	(3)	(4)	(5)	(6)
Nonlinear parameters (Σ)						
Gender	4.035**	3.964**	4.034*		3.844*	4.698**
	(1.823)	(1.795)	(2.169)		(1.965)	(1.826)
Age	7.823***	7.827***	7.791***		6.781***	4.263**
	(1.484)	(1.681)	(2.012)		(1.774)	(1.888)
Minority	0.018	0.016	0.017		-0.219	0.019
	(11.122)	(11.186)	(11.297)		(3.651)	(15.156)
Constant	0.215	-0.185		-0.058	0.200	0.122
	(5.258)	(5.142)		(10.975)	(5.581)	(7.756)
NOTA	0.150	-0.096		0.178	0.163	-0.034
	(4.552)	(8.222)		(27.380)	(4.561)	(6.874)
Ran		-0.229				
		(4.499)				
Won		-0.008				
		(30.999)				
INC			-0.046	-0.004		
			(20.750)	(32.247)		
BJP			0.040	0.043		
			(12.852)	(38.006)		
Indep.				-0.010		
				(39.787)		
Small				-0.103		
				(25.577)		
Education					0.015	
					(13.509)	
Crime					0.008	
					(35.389)	
Missing educ/crime					-0.100	
					(26.58)	
Assets						-0.091
						(11.361)
Missing assets						0.072
						(40.091)
J	89.578	90.129	89.961	188.566	81.178	99.934
df	9	7	9	8	6	7
p-value	0.000	0.000	0.000	0.000	0.000	0.000
Newey-West D	18.351	17.892	18.587	0.043	15.708	8.272
p-value	0.003	0.013	0.002	1.000	0.047	0.309

Notes: Parameter estimates from the BLP model with Normally distributed random coefficients ($\Pi = 0$). Second instrument set. The linear parameters also include indicators for parties, states, and years. Standard errors robust to heteroskedasticity and intra-constituency correlation in parentheses. ***, **, and * indicates significance at 1, 5, and 10 percent, respectively. J is the overidentification test statistic with corresponding degrees of freedom and p-value. Newey-West D is a likelihood ratio test for the null hypothesis that the nonlinear parameters are jointly 0 with the corresponding p-value. N = 9831.

Table 19: Parameter estimates using Normally distributed random coefficients, first instrument set

	(1)	(2)	(3)	(4)
Linear parameters				
Gender	-0.355	-0.357	-0.354	0.822**
	(1.431)	(1.765)	(1.854)	(0.386)
Age	3.631	3.651	3.642	3.095
	(3.511)	(3.806)	(3.990)	(2.093)
Minority	-4.018***	-4.015**	-4.015***	-4.205***
	(1.480)	(1.577)	(1.295)	(0.891)
Ran	0.260**	0.260*	0.260**	0.284***
	(0.132)	(0.149)	(0.105)	(0.101)
Won	0.593***	0.592***	0.592**	0.565***
	(0.111)	(0.124)	(0.257)	(0.111)
NOTA	-4.730	-4.704*	-4.700***	-4.700
	(8.543)	(2.562)	(0.375)	(11.195)
Reserved SC	3.321*	3.318*	3.317**	3.468***
	(1.744)	(1.905)	(1.301)	(0.750)
Reserved ST	3.492**	3.489**	3.489***	3.671***
	(1.670)	(1.752)	(1.238)	(0.698)
Rainfall	-0.064	-0.064	-0.064	-0.063
	(0.083)	(0.067)	(0.050)	(0.053)
Broadcast	-0.001	0.000	-0.001	0.018
	(0.127)	(0.240)	(0.212)	(0.138)
Nonlinear parameters (Σ)				
Gender	2.964	2.961	2.961	
	(1.854)	(1.930)	(2.498)	
Age	1.625	1.649	1.639	
	(7.882)	(6.224)	(4.600)	
Minority	0.044	0.043	0.044	
	(21.648)	(30.731)	(16.593)	
Constant	0.014	-0.007		-0.091
	(47.325)	(50.461)		(15.336)
NOTA	-0.246	0.004		0.178
	(36.242)	(93.134)		(64.525)
Ran		-0.066		
		(21.434)		
Won		0.083		
		(35.835)		
INC			-0.028	-0.001
			(39.315)	(50.013)
BJP			-0.012	0.024
			(30.408)	(66.445)
Indep.				-0.065
				(50.922)
Small				-0.101
				(31.923)
J	64.127	63.967	64.135	77.391
df	6	4	6	5
p-value	0.000	0.000	0.000	0.000
Newey-West D	1.916	1.917	1.916	0.028
p-value	0.861	0.964	0.861	1.000

Notes: Parameter estimates from the BLP model with Normally distributed random coefficients ($\Pi = 0$). First instrument set. The linear parameters also include indicators for parties, states, and years. Standard errors robust to heteroskedasticity and intra-constituency correlation in parentheses. ***, **, and * indicates significance at 1, 5, and 10 percent, respectively. J is the overidentification test statistic with corresponding degrees of freedom and p-value. Newey-West D is a likelihood ratio test for the null hypothesis that the nonlinear parameters are jointly 0 with the corresponding p-value. N = 9831.

Table 20: Parameter estimates using Normally distributed random coefficients, third instrument set

	(1)	(2)	(3)	(4)
Linear parameters				
Gender	-2.268**	-2.260*	-2.262*	0.411**
	(1.112)	(1.233)	(1.223)	(0.203)
Age	5.813***	5.783**	5.782**	1.814**
	(2.093)	(2.435)	(2.261)	(0.873)
Minority	-0.466	-0.473	-0.473	-1.064***
	(0.410)	(0.511)	(0.445)	(0.211)
Ran	0.203**	0.203	0.203**	0.314***
	(0.097)	(0.150)	(0.100)	(0.065)
Won	0.589***	0.589***	0.589***	0.642***
	(0.099)	(0.171)	(0.123)	(0.072)
NOTA	-3.906*	-3.904**	-3.901***	-3.702
	(2.283)	(1.573)	(0.148)	(3.927)
Reserved SC	0.233	0.240	0.241	0.887***
	(0.412)	(0.480)	(0.437)	(0.179)
Reserved ST	0.496	0.501	0.501	1.117***
	(0.359)	(0.462)	(0.384)	(0.187)
Rainfall	-0.001	-0.002	-0.002	-0.026
	(0.055)	(0.058)	(0.058)	(0.037)
Broadcast	-0.046	-0.047	-0.048	-0.083
	(0.142)	(0.201)	(0.146)	(0.090)
Nonlinear parameters (Σ)				
Gender	3.964***	3.964***	3.968**	
	(1.310)	(1.390)	(1.516)	
Age	6.054***	6.021***	6.019***	
	(1.855)	(1.785)	(1.883)	
Minority	0.003	0.016	0.001	
	(9.377)	(10.664)	(9.429)	
Constant	0.165	0.038		-0.074
	(6.818)	(9.043)		(8.432)
NOTA	-0.050	-0.018		0.127
	(50.438)	(33.687)		(31.699)
Ran		-0.037		
		(19.638)		
Won		0.082		
		(16.773)		
INC			-0.040	-0.001
			(14.164)	(21.240)
BJP			0.015	0.026
			(11.672)	(33.256)
Indep.				0.012
				(22.518)
Small				-0.097
				(21.675)
J	192.940	193.666	193.748	249.125
df	12	10	12	11
p-value	0.000	0.000	0.000	0.000
Newey-West D	22.161	22.242	22.199	0.054
p-value	0.000	0.002	0.000	1.000

Notes: Parameter estimates from the BLP model with Normally distributed random coefficients ($\Pi = 0$). Third instrument set. The linear parameters also include indicators for parties, states, and years. Standard errors robust to heteroskedasticity and intra-constituency correlation in parentheses. ***, **, and * indicates significance at 1, 5, and 10 percent, respectively. J is the overidentification test statistic with corresponding degrees of freedom and p-value. Newey-West D is a likelihood ratio test for the null hypothesis that the nonlinear parameters are jointly 0 with the corresponding p-value. N = 9831.

4.2 Further specifications with voter demographics

Table 21 contains further estimation results for specifications with voter demographics. Columns 1-4 include different nonlinear parameters, and column 5 is for the preferred specification discussed in the paper but excluding the state of Mizoram.

Figure 5 and Table 22 describe the results from the counterfactual (no-NOTA) exercise using the various specifications. Results from the preferred specification discussed in the text are in column (1).

Table 23 shows estimates of the preferred specification when the aggregation of "small parties" is based on the alternative definitions discussed in section 3.1 above (using cutoffs of 1/2 or 1/4). Tables 24-26 present the counterfactual results corresponding to these estimates. These alternative definitions cause little change in the results. The share of protest voters who normally abstain remains around 2/3 (Table 24), and protest voters make up small shares of any given party's supporters (Tables 25 and 26). When the smaller threshold for aggregation is used in Table 26, we find that the party from which voters are relatively most likely to switch to NOTA is the SHS or "Army of Shivaji" (with the 1/3 threshold this party was part of the Small party category). This is a far-right nationalist party advocating preferential treatment for the Marathi ethnic group and intolerance towards others, especially the non-Hindi. It has been associated with a number of violent ethnic riots.[11]

Figure 6 shows the geographic distribution of the counterfactual results (the share of the NOTA voters who would abstain without NOTA)

Table 27 explores the heterogeneity in protest voters' behavior across constituencies by focusing on one constituency characteristic at a time. The estimated correlations are qualitatively similar to those reported in the paper.

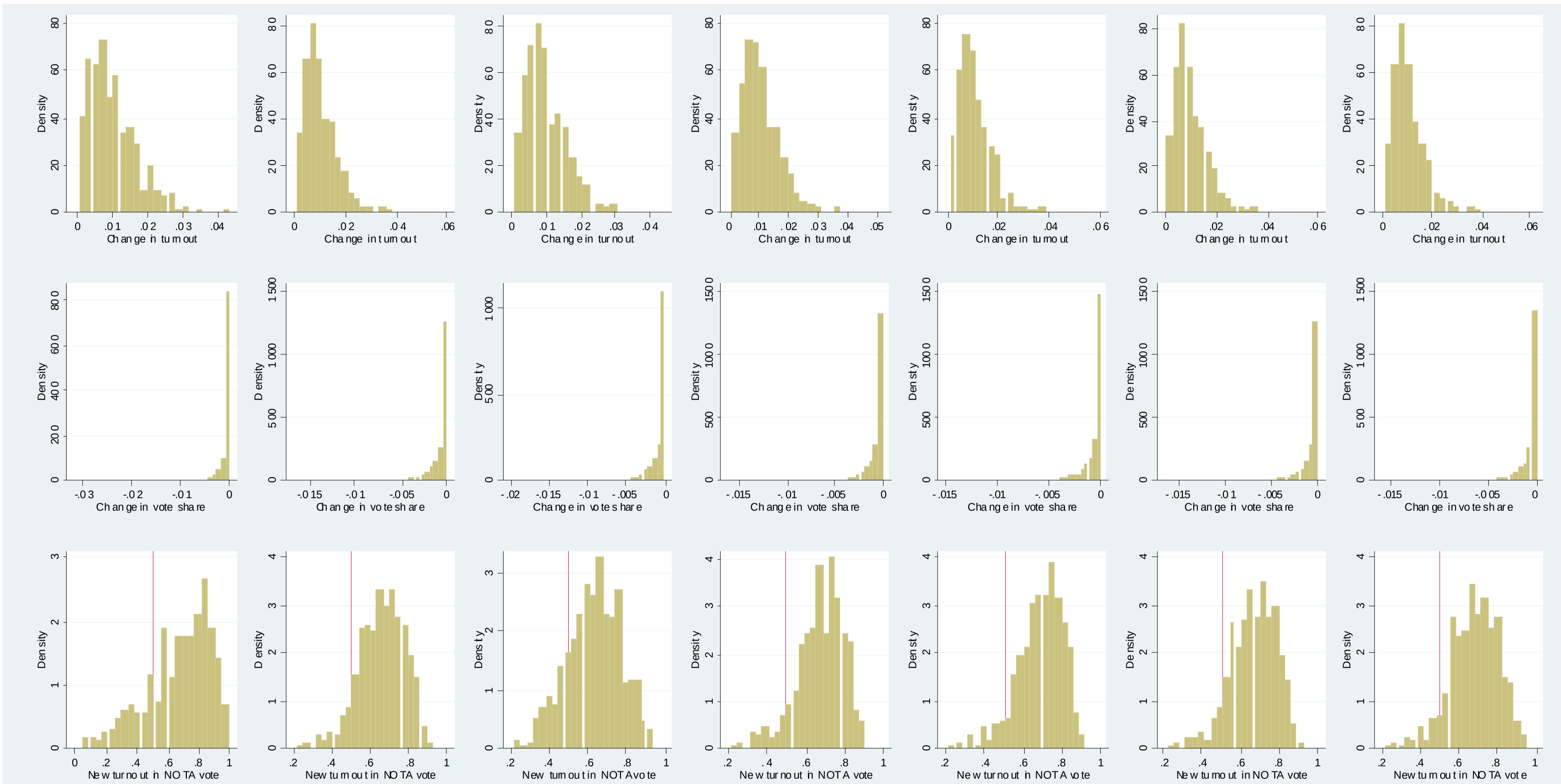
[11] http://www.elections.in/political-parties-in-india/shiv-sena.html

Table 21: Parameter estimates using voter demographics, additional specifications

	(1)	(2)	(3)	(4)	(5)
Linear parameters					
Gender	6.980***	8.852***	6.926***	7.253***	6.677***
	(2.289)	(3.135)	(2.339)	(2.408)	(2.340)
Age	-1.201	-10.822	-0.825	-0.603	-0.828
	(3.086)	(8.554)	(3.287)	(3.251)	(3.608)
Minority	-5.083***	-3.750***	-5.405***	-5.435***	-6.071***
	(0.784)	(0.890)	(0.842)	(0.825)	(2.111)
Ran	0.216	0.149	0.243	0.221	0.291
	(0.172)	(0.182)	(0.190)	(0.181)	(0.295)
Won	0.562***	0.587***	0.544***	0.549***	0.542***
	(0.167)	(0.188)	(0.182)	(0.178)	(0.186)
NOTA	-3.960***	-3.841***	-3.910***	-3.424***	-4.024***
	(0.199)	(0.197)	(0.234)	(0.509)	(0.258)
Reserved SC	3.741***	2.666***	3.929***	4.006***	4.503***
	(0.563)	(0.691)	(0.611)	(0.592)	(1.688)
Reserved ST	1.641***	1.397***	1.444***	1.753***	1.791***
	(0.275)	(0.217)	(0.509)	(0.309)	(0.413)
Rainfall	-0.125	-0.151	-0.141	-0.137	-0.141
	(0.080)	(0.100)	(0.090)	(0.087)	(0.088)
Broadcast	-0.208	-0.264	-0.280	-0.266	-0.315
	(0.258)	(0.279)	(0.284)	(0.275)	(0.348)
Nonlinear parameters (pi)					
Gender x Minority	-5.406	-10.658	-4.438	-4.750	-3.609
	(4.191)	(7.566)	(4.120)	(4.191)	(4.780)
Gender x Literate	-13.938**	-14.516**	-13.594*	-14.625**	-12.875*
	(6.639)	(5.791)	(7.024)	(7.204)	(7.224)
Age x Minority	17.328***	11.258***	20.063***	18.125***	21.922*
	(2.814)	(4.198)	(4.016)	(2.828)	(11.326)
Age x Rural worker	8.625***	27.484***	10.063***	10.063***	8.922***
	(2.557)	(17.000)	(2.698)	(2.651)	(3.181)
NOTA x Minority			0.998		
			(1.299)		
NOTA x Rural worker		8.076			-0.102
		(6.917)			(0.538)
NOTA x Literate				-0.820	
				(0.784)	
Constant x Rural worker	-0.047	-7.980	-0.156	-0.406	
	(0.448)	(6.940)	(0.495)	(0.637)	
J	8.204	11.266	9.613	8.892	11.387
df	9	8	8	8	8
p-value	0.514	0.187	0.294	0.352	0.1807
Newey-West D	17.900	17.854	38.156	34.162	21.559
p-value	0.003	0.007	0.000	0.000	0.000

Notes: Parameter estimates from the BLP model using voter demographics ($\Pi \neq 0$). Second instrument set. Column (5) excludes the state of Mizoram. The linear parameters also include indicators for parties, states, and years. Standard errors robust to heteroskedasticity and intra-constituency correlation in parentheses. ***, **, and * indicates significance at 1, 5, and 10 percent, respectively. J is the overidentification test statistic with corresponding degrees of freedom and p-value. Newey-West D is a likelihood ratio test for the null hypothesis that the nonlinear parameters are jointly 0 with the corresponding p-value. N = 9831 in columns (1)-(4), N = 9720 in column (5).

Figure 5: Counterfactual results from different specifications



Notes: Each column presents the simulated impact of NOTA from a different specification. Graphs in the first row show changes in turnout across constituencies. Graphs in the second row show the change in vote shares (as a fraction of eligible voters) across individual candidates. Graphs in the third row show the share of the NOTA voters in a constituency who would abstain without NOTA (vertical lines are at 0.5). From left to right, the specifications are for column 1, Table 6 in the paper (first instrument set), columns 1-4, Table 21 in the Appendix (alternative specifications), column 5, Table 6 in the paper (education, criminal history and assets), and column 5, Table 21 in the Appendix (no Mizoram). For each column except the last, N = 520, N = 3073, and N = 520 for rows 1-3, respectively. For the last column the corresponding numbers are N = 507, N = 3031, and N = 507.

Table 22: Counterfactual results from different specifications

Specification	Main text Table 6 (2) (1)	Main text Table 6 (1) (2)	Appendix Table 21 (1) (3)	Appendix Table 21 (2) (4)	Appendix Table 21 (3) (5)	Appendix Table 21 (4) (6)	Main text Table 6 (5) (7)	Appendix Table 21 (5) (8)
Change in turnout (ppoint)	1.075	1.057	1.047	0.982	1.067	1.086	1.053	1.097
Standard deviation	0.700	0.734	0.688	0.610	0.667	0.694	0.687	0.722
Change in candidate vote shares (ppoint)	-0.084	-0.087	-0.088	-0.099	-0.085	-0.082	-0.087	-0.084
Standard deviation	0.140	0.204	0.146	0.167	0.145	0.136	0.145	0.144
Largest change in candidate vote share (ppoint)	-0.280	-0.343	-0.295	-0.326	-0.287	-0.271	-0.292	-0.291
Standard deviation	0.217	0.379	0.223	0.262	0.225	0.209	0.221	0.225
Share of NOTA vote due to new turnout	0.679	0.668	0.660	0.628	0.678	0.688	0.664	0.679
Standard deviation	0.121	0.207	0.119	0.139	0.123	0.120	0.119	0.125
Elections where winner changes	2	2	2	2	2	2	2	2

Notes: Means and standard deviations of the simulated impact of NOTA from different specifications. Column 1 is the preferred specification discussed in the paper. Columns (2)-(8) correspond to the graphs in Figure 5 above (2: different instruments, 3-6: different demographic interactions, 7: education, criminal history and assets, 8: excluding the state of Mizoram). See notes to Figure 5 for details.

Table 23: Parameter estimates using alternative aggregation thresholds for small parties

	(1)	(2)
Linear parameters		
Gender	5.913***	6.124***
	(2.033)	(2.215)
Age	-1.798	1.078
	(2.739)	(3.353)
Minority	-5.159***	-5.055***
	(0.693)	(0.833)
Ran	0.500***	0.198
	(0.158)	(0.168)
Won	0.595***	0.483***
	(0.147)	(0.178)
NOTA	-3.940***	-3.873***
	(0.189)	(0.200)
Reserved SC	3.866***	3.710***
	(0.507)	(0.598)
Reserved ST	1.777***	1.594***
	(0.275)	(0.284)
Rainfall	-0.119	-0.130
	(0.073)	(0.088)
Broadcast	-0.526**	-0.068
	(0.248)	(0.265)
Nonlinear parameters (Π)		
Gender x Minority	-2.789	-0.758
	(3.000)	(5.127)
Gender x Literate	-11.188*	-12.625*
	(5.890)	(7.152)
Age x Minority	16.188***	17.469***
	(3.200)	(5.127)
Age x Rural worker	7.500***	9.531***
	(2.218)	(2.677)
NOTA x Rural worker	-0.236	0.063
	(0.464)	(0.425)
J	11.539	13.0895
df	9	9
p-value	0.2405	0.1586
Newey-West D	48.590	39.308
p-value	0.000	0.000

Notes: Parameter estimates from the BLP model using voter demographics ($\Pi \neq 0$). Second instrument set. The aggregation threshold for small parties is 1/2 in column (1) and 1/4 in column (2). The linear parameters also include indicators for parties, states, and years. Standard errors robust to heteroskedasticity and intra-constituency correlation in parentheses. ***, **, and * indicates significance at 1, 5, and 10 percent, respectively. J is the overidentification test statistic with corresponding degrees of freedom and p-value. Newey-West D is a likelihood ratio test for the null hypothesis that the nonlinear parameters are jointly 0 with the corresponding p-value. N = 9342 in column (1) and 10359 in column (2).

Table 24: Counterfactual results for different aggregation thresholds for small parties

Specification	Appendix Table 23 (1) (1)	Appendix Table 23 (2) (2)
Change in turnout (ppoint)	1.034	1.054
Standard deviation	0.686	0.691
Change in candidate vote shares (ppoint)	-0.095	-0.080
Standard deviation	0.151	0.142
Largest change in candidate vote share (ppoint)	-0.300	-0.293
Standard deviation	0.223	0.226
Share of NOTA vote due to new turnout	0.650	0.666
Standard deviation	0.117	0.121
Elections where winner changes	2	2

Notes: Means and standard deviations of the simulated impact of NOTA obtained from the specifications in Table 23. The aggregation threshold for small parties is 1/2 in column (1) and 1/4 in column (2).

Table 25: Impact of NOTA on vote shares by party with 1/2 aggregation threshold for small parties

Choice	N. of candidates	Elections won	Percent of all voters	Change due to NOTA Full model (percentage points)	Full model (percent)
	(1)	(2)	(3)	(4)	(5)
BJP	507	361	32.910	-0.221	-0.671
BSP	499	8	3.623	-0.030	-0.842
BYS	102	0	0.102	-0.002	-1.532
CSM	54	0	0.223	-0.004	-1.830
INC	519	127	26.732	-0.185	-0.692
Independents	469	15	4.963	-0.048	-0.966
MNF	10	1	0.057	0.000	-0.246
NPEP	133	4	1.294	-0.010	-0.756
NOTA			1.578		
SP	154	0	0.395	-0.002	-0.618
Small parties	458	4	2.993	-0.032	-1.069
ZNP	11	0	0.016	0.000	-0.259
Abstention			25.114	-1.044	-4.157

Notes: Tabulation of all the choices available in the data used for the counterfactual exercise. For each party column (1) shows the total number of candidates and (2) the number of constituencies won. Column (3) is the share of all voters (out of 101.384 million eligible voters) choosing each option in the data. Column (4) gives the simulated effect of introducing NOTA in the full model, (5) is (4) divided by (3), times 100.

Table 26: Impact of NOTA on vote shares by party with 1/4 aggregation threshold for small parties

Choice	N. of candidates	Elections won	Percent of all voters	Change due to NOTA Full model (percentage points)	Full model (percent)
	(1)	(2)	(3)	(4)	(5)
BASD	62	0	0.163	-0.001	-0.570
BJP	507	362	32.910	-0.212	-0.645
BSP	499	8	3.623	-0.030	-0.833
BYS	102	0	0.102	-0.002	-1.496
CSM	54	0	0.223	-0.004	-1.875
GGP	106	0	0.536	-0.007	-1.346
INC	519	127	26.732	-0.177	-0.661
Independents	469	15	4.963	-0.045	-0.915
JGP	85	0	0.060	-0.001	-1.237
MNF	10	1	0.057	0.000	-0.225
NCP	68	0	0.096	-0.001	-1.092
NPEP	159	4	1.331	-0.010	-0.776
NOTA			1.578		
SHS	27	0	0.037	-0.001	-2.279
SP	250	0	0.550	-0.004	-0.661
Small parties	406	3	1.907	-0.019	-0.972
ZNP	11	0	0.016	0.000	-0.256
Abstention			25.277	-1.065	-4.214

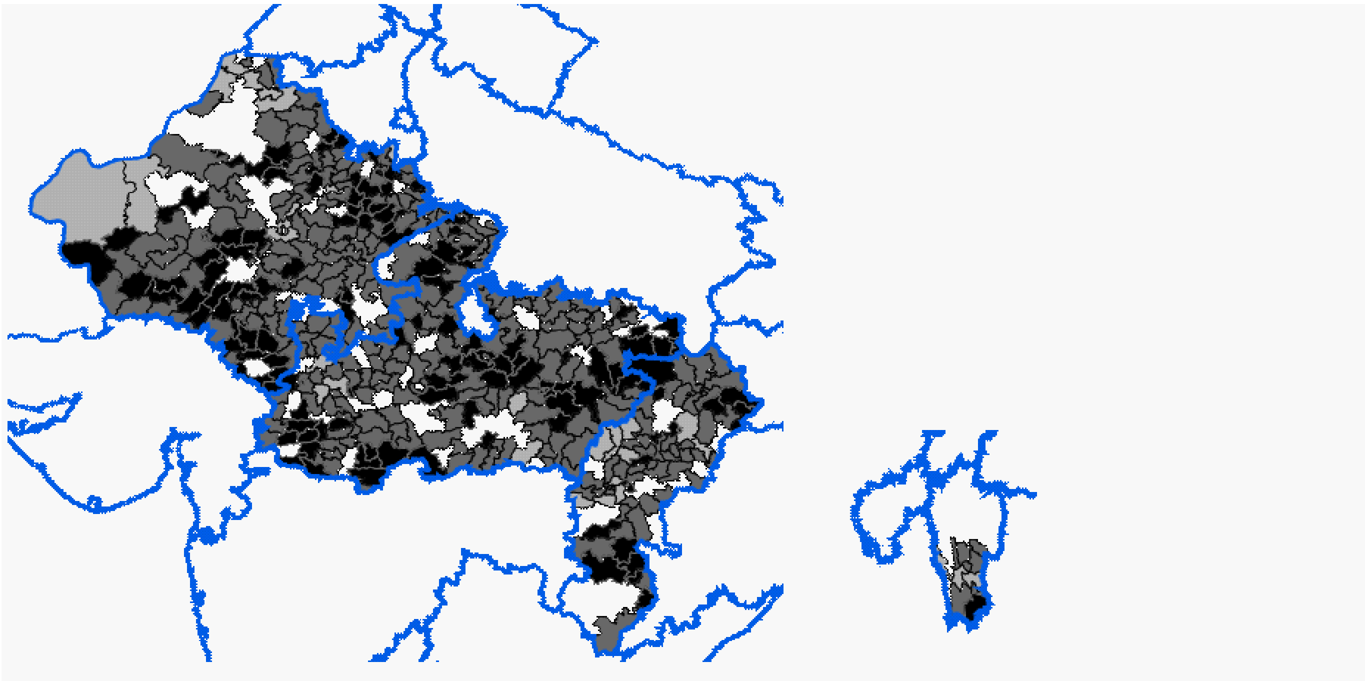
Notes: Tabulation of all the choices available in the data used for the counterfactual exercise. For each party column (1) shows the total number of candidates and (2) the number of constituencies won. Column (3) is the share of all voters (out of 101.384 million eligible voters) choosing each option in the data. Column (4) gives the simulated effect of introducing NOTA in the full model, (5) is (4) divided by (3), times 100.

Table 27: Heterogeneity in the behavior of protest voters with one constituency characteristic at a time

Dep. Var.:	Share of NOTA voters switching to		
	Abstention	Major parties	Other parties
Reserved	0.046***	-0.024***	-0.021**
	(0.011)	(0.007)	(0.011)
Literacy	-0.310***	0.146***	0.164***
	(0.058)	(0.038)	(0.059)
Size	0.069	-0.052*	-0.017
	(0.045)	(0.029)	(0.045)
Minority pop.	0.235***	-0.066***	-0.168***
	(0.029)	(0.019)	(0.030)
Rural workers	0.132***	-0.010	-0.122***
	(0.033)	(0.021)	(0.033)
N.candidates	-0.003***	0.005***	-0.002**
	(0.001)	(0.001)	(0.001)
Female cand.	0.002	0.020***	-0.022**
	(0.011)	(0.007)	(0.010)
Minority cand.	-0.012	-0.013	0.025*
	(0.015)	(0.010)	(0.015)

Notes: Systems of seemingly unrelated regressions of the share of NOTA voters switching to abstention, major parties (INC or BJP) or other parties in each constituency in the counterfactual. Each row is estimated as a separate system, with one covariate in each regression (plus state fixed effects). Size is log(number eligible voters). Female cand. is 1 if there is at least one female candidate running, Minority cand. is 1 if there is at least one minority candidate. Standard errors in parentheses. ***, **, and * indicates significance at 1, 5, and 10 percent, respectively.

Figure 6: Geographic distribution of the share of NOTA voters who abstain without NOTA



Notes: Share of NOTA voters who abstain when NOTA is removed based on the main counterfactual analysis in the paper. Light grey: <50 %, dark grey: 50-75 %, black: >75 %.

4.3 Additional results on compulsory voting with and without NOTA

This section presents further details on the counterfactual results with compulsory voting discussed in the paper. Table 28 summarizes the distribution of counterfactual results across constituencies. When NOTA is available, compulsory voting increases its votes share by 6.8 percent of eligible voters in the average constituency. Compulsory voting increases the share of NOTA votes among votes cast by a factor of four (6.3 percentage points). Some candidates also experience large losses in vote shares: as a fraction of votes cast, the largest loss in the average constituency is 6.7 percentage points.

The lower half of Table 28 presents corresponding results when compulsory voting is introduced in an environment without NOTA. We find that compulsory voting leads to similar losses in vote shares as it did with NOTA, but the gains are now more concentrated, and some candidates see a large increase in their vote share (the largest gain is 5.3 percentage points on average).

Table 28: The impact of compulsory voting with and without NOTA

	Mean	Std. Dev.	Median	10%	90%	N
With NOTA						
Increase in NOTA votes (fraction of eligible voters)	0.068	0.045	0.061	0.016	0.126	520
Increase in NOTA votes (fraction of votes cast)	0.063	0.043	0.057	0.012	0.120	520
Largest drop in candidate's vote share (fraction of votes cast)	-0.067	0.029	-0.063	-0.106	-0.034	520
Largest increase in candidate's vote share (fraction of votes cast)	0.023	0.024	0.016	0.002	0.053	520
Election overturned (0/1)	0.150					520
Without NOTA						
Largest drop in candidate's vote share (fraction of votes cast)	-0.062	0.032	-0.058	-0.106	-0.022	520
Largest increase in candidate's vote share (fraction of votes cast)	0.053	0.033	0.046	0.017	0.101	520
Election overturned (0/1)	0.225					520

Notes: Results from a counterfactual simulation removing the possibility of abstention when NOTA is available (upper panel), and when it is not (lower panel). Election overturned is equal to 1 if removing abstention changes the winner of the election.

Table 29 shows the impact of compulsory voting on elections ignoring counterfactual wins by aggregated small party or independent candidates. With NOTA, compulsory voting changes the winner in 13.8% of elections. With NOTA, this figure is 21%. The BJP is a net loser and the INC a net winner in both cases, with larger differences when NOTA is not available.

5 The direct cost of NOTA

Including a NOTA option on an existing voting machine simply involves labeling one of the buttons, exactly as would be done if a new candidate was added to the ballot. The cost of this is negligible.

The direct costs of NOTA are higher if the voting machine has to be modified. The voting machines used in India have two parts, a Control Unit, which is operated by the election official to authorize a vote to be cast, and one or more Balloting Units, on which the actual votes are cast.[12] Each balloting unit has buttons for 16 different candidates, and each control unit can operate up to 4 balloting units. This means that if the number of candidates before

[12] http://eci.nic.in/eci_main1/evm.aspx

Table 29: The impact of compulsory voting on parties ignoring aggregated candidates

Choice	Change due to compulsory voting			
	with NOTA		without NOTA	
	Extra wins	Extra losses	Extra wins	Extra losses
BJP	18	46	28	71
BSP	7	3	13	3
BYS	0	0	0	0
CSM	0	0	0	0
GGP	0	0	0	0
INC	45	19	64	30
Independents	0	2	0	2
JGP	0	0	0	0
MNF	0	0	1	0
NPEP	0	1	1	1
NOTA	1	0	0	0
SP	0	0	0	0
Small parties	0	0	0	0
ZNP	0	0	0	0
Total	71	71	107	107
Share of all	13.8	13.8	21.0	21.0

Notes: Number of additional constituencies won and lost by each party as a result of compulsory voting, with or without NOTA, Counterfactual wins by aggregated small party or independent candidates are ignored, leaving 513 elections in the with-NOTA and 510 in the without-NOTA case.

NOTA is either 16 or 32, a new balloting unit has to be linked to an existing control unit in order to accommodate the NOTA option. If the number of candidates before NOTA is 64, adding NOTA requires both a new control unit and a new balloting unit.

In the 520 constituencies in the counterfactual exercise, the highest number of candidates is 38 so introducing NOTA never requires a new control unit. The number of candidates is 16 in 13 constituencies and 32 in 2 constituencies. Thus, a possible estimate of the direct cost of NOTA in this sample is the cost of 13 + 2 =15 new balloting units.

While the cost of a separate balloting unit is unknown, as of 2014 the cost of one control unit plus one balloting unit was estimated at \$175.[13] Assuming that the cost of a separate balloting unit is half of that, the direct cost of introducing NOTA in this sample would be $175/2 \times 15 = 1312.50$ dollars, or about \$13 for every 1 million eligible voters.

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[13] https://www.theatlantic.com/international/archive/2014/04/indian-democracy-runs-on-briefcase-sized-voting-machines/360554/