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Does a Swing Voter Model with Voter Turnout reflect the closeness of Indian State Elections: 1957 – 2018?[1]

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Does a Swing Voter Model with Voter Turnout reflect the closeness of Indian State Elections: 1957 – 2018?[1]

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Abstract

In the classic model of Besley, Persson and Strum (2010) voters are viewed as either committed to a political party or uncommitted, available for capture by the offer of policies that better reflect the programs they desire. Through an inter-party electoral competition for the support of such swing voters government services become aligned with those most desired by the electorate and the efficiency by which government services are provided is enhanced. In this paper we extend the BPS model to incorporate voter turnout, develop a new method of measuring the salience of noneconomic issues and then test the model's predictions on election data from 14 Indian States between the years 1957 and 2018. The results are broadly consistent with the predictions of the model but fit particularly well the lesser developed, so-called BIMAROU states. That is, an election is more competitive, as measured by having a smaller first versus second place vote share margin, when voter turnout is higher and both the proportion of asymmetrically adjusted safe seats and the state distribution of vote volatilities across constituencies are lower.

Key words: swing voter, committed-uncommitted voter, voter turnout, political competition, Indian states
JEL: H11, P16, P48, O53.

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1. Introduction

While the committed/uncommitted voter model of Besley, Persson and Strum (2005, 2010) is itself one of the most often cited models in the political economy literature, it has also become, perhaps more importantly, central to the intuition of the probabilistic voting literature that underlies much of contemporary public choice and public economics.[2] With its focus on the conditions needed for competitive party elections, it stands as an important first step in the case arguing for the importance of political competition in promoting government efficiency and producing the programs and services most valued by the electorate. That is, without an incentive to respond to nonpartisan voters there is no mechanism to induce the governing party to respond efficiently to the will of the broader electorate. Our contribution to this literature is first to modify the model of Besley, Persson and Strum (hereafter BPS) to allow for the choice by uncommitted voters whether to participate in an upcoming election or not. Second, we expand the operationality of the resulting model by introducing a new measure of the salience of noneconomic issues to voters. We then take the model and its refinements to the data to test its predictions on the closeness of elections from data covering 14 major Indian states over the period 1957 to 2018.[3,4]

2. Adapting the committed-uncommitted voter model for turnout

We begin by reproducing the political model of Besley, Persson and Strum (hereafter BPS) model and add to it the feature that not all uncommitted voters chose to participate in an election. The BPS model focusses on two types of voters who can vote for one of two parties, p = 1 or 2. A fraction of the voters, $1-\sigma$, are committed to a preferred party and receive an additional utility gain, Δ, if their preferred party is elected. The remaining fraction of voters,

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[2] The model has so far received around 750 citations. For a variety of contemporary articles utilizing the swing voter model in the context of probabilistic voting see Profeta (2002, 2007), Piwowarski (2015), Green (2020), Winer et al (2021) and Bierbrauer et al (2022).

[3] The 14 Indian states included in our study are: Andhra Pradesh, Bihar, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal. Assam was excluded because it was subdivided twice during the 70's and 80's and because it has experienced long periods of communal tension with associated outbreaks of violence. Jammu and Kashmir is excluded for similar reasons. From the 2011 Census, the 14 states cover roughly 85% of India's population of 1.2 billion individuals.

[4] We have some data for the first set of state elections in 1952, but at that stage only 7 of our 14 states existed. A major state reorganization took place in 1956 as a result of which 4 new states (Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu) were formed. Our panel then begins in 1957 with two new states (Maharashtra and Gujarat) formed in 1960 by bifurcating Bombay state. First elections in these states took place in 1962. Finally, Haryana was formed in 1966 (with its first election in 1967) from Punjab.

σ, are uncommitted or swing voters. Among the committed voters, some fraction λ favour party 1 so that party 1 can count on votes equal to $(1-\sigma)\,(1+\lambda)/2$, where λ can be positive or negative. We add to the model the feature that not all uncommitted voters will turn out to vote. Hence while core voters can be expected to vote for their chosen party, we let γ be the proportion of swing voters who choose to participate in the election before choosing which party to support.[5] It follows that the fraction of committed voters who favor party 1 is $(1-\sigma)\,(1+\lambda)/2$, the fraction of potential voters who favor party 2 is $(1-\sigma)\,(1-\lambda)/2$, and the percentage of registered voters who are both uncommitted and available to the two competing parties is $\gamma\sigma$.

Swing voters choose which party to support based on the net value to them of the economic and noneconomic positions taken by the two parties. The economic value to a swing voter of having party 1 in office depends on the policies chosen by the party, τ_1, and is equal to $v_1 = q(\tau_1)$. There is a similar function for the policies chosen by party 2. The noneconomic value of having the political position of party 1 in office (rather than 2) is ω which can be positive or negative and is assumed to be uniformly distributed across swing voters over the range $\left[-\frac{1}{2\varphi}, \frac{1}{2\varphi}\right]$ with $\frac{1}{2\varphi} < \Delta$. Letting η be the value of an aggregate popularity shock in favor of party 1, a swing voter will vote for party 1 whenever

$$\eta + \omega + v_1 - v_2 > 0.$$

With this parameterization, the condition for a party 1 victory becomes:

$$\sigma\gamma\varphi(v_1 - v_2 + \eta) + (1-\sigma)\frac{\lambda}{2} > 0,$$

where the first term is the proportion of the swing voters who favor party 1 over party 2 and the second term is the proportion of committed voters who favor party 1. This can be rewritten as

$$\frac{(1-\sigma)\lambda}{2(\gamma\sigma)\varphi} + (v_1 - v_2 + \eta) > 0,$$

where the first term is called by BPS (p. 1333) "the electoral advantage term". It follows that for any policy preference difference in favor of party 1 in combination with the realization of its favorable party shock $(v_1 - v_2 + \eta)$, party i is more likely to win electorally: the larger is

[5] A strong positive correlation has been found in the political science literature between voter turnout and electoral competitiveness suggesting that higher turnout comes primarily from nonpartisan voters. See, for example, Matsusaka (1993) and Geys (2006).

the proportion of committed voters, $(1-\sigma)$, the larger is the proportion of committed voters favoring party 1, λ; the smaller is voter turnout, $\sigma\gamma$; and the smaller is the density of swing voter preferences for party 1, φ. Alternatively, an election will be more competitive in the sense that the winning vote share margin is smaller, the smaller is the difference in voters' policy preference plus its realization of a favorable party shock $(v_1 - v_2 + \eta)$; the smaller is the proportion of committed voters committed to party $i, (1-\sigma)\lambda$; the larger is voter turnout, $\sigma\gamma$; and the lower the salience of noneconomic issues (the larger is φ).[6]

3. Variables used to in a test of the Committed/Uncommitted voter model

In this section we set out a test of our extension of the BPS model on Indian State Assembly election data and the other variables used to proxy different elements of the model. Our data set runs from 1957 through 2018 and includes the outcomes of 195 state elections from 14 states. With some initial values missing and successive early elections needed to construct our set of explanatory variables, the number of useable electoral observations reduces to 152. Summary statistics and data sources of the used variables are included in the data appendix.

In developing our empirical model, we first recognize that voters' perception of the difference in value of the policies offered by competing parties, $v_1 - v_2$, in combination with the favorable party shock across parties, η, will be unobservable. Hence to operationalize the model, we assume that for third party viewers this outcome is viewed as random over time. Conditional on this assumption the first versus second place vote share winning margin, used as our measure of electoral competitiveness, is functionally related to the other three characteristics hypothesized as determining electoral outcomes: the asymmetry adjusted vote share represented by committed voters, $(1-\sigma)\lambda$; the salience of noneconomic issues to voters, $(1/\varphi)$; and voter turnout, $\sigma\gamma$.

To reflect the degree of asymmetry in committed voters, we use asymmetrically adjusted safe seats in the legislative (*ASSL*) as constructed by Dash et al (2019) for 14 Indian States between 1957 and 2012 and extended through 2018 by the authors.[7] This measure was formed by first finding for each state at time *t* the historical volatility adjusted winning margin for incumbent

[6] BPS view "an increase in the density φ of our assumed uniform … as approximating … a shift towards a more ideologically neutral electorate" (2010, footnote 5).

[7] Originally developed for Canadian provinces. See Ferris et al (2016).

party *p* at time *t-1* for constituency *j* as $IPmargin_{pjt} = \frac{(v_{1pjt-1} - v_{2jt-1})}{Volatility_{jt-1}}$. Then a distribution of past constituency outcomes was formed by size for a rolling average of three previous elections and a one standard deviation cutoff rule was used to define the number and hence the proportion of seats considered safe in each election, ψ_t.[8] To reflect the degree to which the distribution of safe seats departs from an equal distribution of safe seats across contending parties, we adjusted the proportion of safe seats by the degree of asymmetry among parties in their holding of safe seats by using the Euclidean deviation from a three-party equal sharing of safe seats, $\phi 3_t$. That is, defining a third party as the vote share received by all parties other than the top two, the measure of deviation becomes $\phi 3_t = \sqrt{3/2} * \sqrt{(1/3 - S_{1t})^2 + (1/3 - S_{2t})^2 + (1/3 - S_{3t})^2}$, where S_{it} = the seat share in the state legislature of the party in ith place in terms of seats. The measure of asymmetrically adjusted safe legislative seats the product of the two steps, $ASSL_t = \psi_t \phi 3_t$ and is expected to be positively related to the first versus second vote share winning margin.

The second element is the salience of noneconomic issues to voters and our proxy for this is the coefficient of variation of vote volatilities across all state constituencies. That is, we argue that a country like India has considerable ethnic, social and cultural heterogeneity both within and across its individual constituencies that will result in different responses to common economic and political state circumstances. In this case the distribution of the vote volatilities across constituencies will then better reflect the political importance of noneconomic factors on state outcomes than would the state-wide average. To reflect the differences in the salience of noneconomic issues across states we use the coefficient of variation of individual state constituency volatilities as our measure of that distribution. The prediction is that the higher the coefficient of variation, the higher is the salience of noneconomic issues to voters (the lower the φ), the less competitive will be the election and the larger will be the winning margin.[9]

To measure the coefficient of variation of constituency vote volatilities we begin by following Przeworski and Sprague (1971) and Pedersen (1979) who define constituency vote volatility

[8] Because *IPmargins* require three successive sets of election results in the distribution from which safe seats are determined, our measures of ψ_t and $ASLS_t$ begin only in 1971.

[9] See Selway (2021) who uses geographic ethnic heterogeneity to reflect noneconomic salience and explain differences in spending between countries using proportional representation versus majoritarian election rules.

as $Volatility_{jt} = \frac{\sum_{p=1}^{n}|v_{pjt} - v_{pjt-1}|}{2}$, where v_{pjt} is the vote share of party *p* in constituency *j* in election year t. It measures the extent of vote shifting among political parties in each constituency between consecutive elections.[10] The coefficient of variation of constituency volatility, Vol_CV, is then found as the standard deviation of these constituency volatilities across each state divided by the state mean. Increases in Vol_CV are expected to be negatively related to the size of the winning margin.

The third element in electoral advantage, voter turnout, is defined here as the proportion of registered voters who participate in the election by voting and where an increase voter turnout is expected to decrease the size of the winning margin. While *ASSL* and volatility are largely historical by construction, the same cannot be said of voter turnout. Hence to account for endogeneity, we instrument voter turnout with the expected value generated by a recent empirical model of voter turnout across these Indian states.[11]

All Indian states operate under the same basic political institutions, a single member Westminster parliamentary form of representative government requiring the maintenance of confidence over a maximum 5-year term. However, the specific forms of party systems of governance have evolved somewhat differently across Indian states over time. To incorporate party structure differences across states that may affect the size of the first versus second place winning margin, we control for the appearance of coalition government, Coalition, and for instances when the central government has taken over governance of the state through presidential rule, President. The rational for using Coalition and President comes from Dash and Ferris (2021) who identify these differences as two India-specific determinants of vote shifting among parties between elections. While they use the formation of coalition governments and imposition of president's rule as proxies for uncertainty in a state's political

[10] In India every election brings in many new parties and leads to many parties exiting. To operationalize vote volatility, we follow Dash et al (2019) who define a party as one of the top ten vote receiving state parties in three successive elections or one that has received more than eight percent of the vote in one election. Using this criterion, the number of political parties varies from 14 in Gujarat to 24 in Uttar Pradesh over our period of study and account for more than 90 percent of the vote in each election. Candidates contesting elections without the support of a political party are called independents. Whether independents are grouped together with other small parties not meeting our criteria for party status makes no significant difference to our volatility results.

[11] The equation used to produce the instrumented value for voter turnout corresponds to column (3) in Table 5 of Dash et al (2021). This is reproduced in section B of the Data Appendix of the paper.

environment and predict that to have negative relation with electoral volatility, we are uncertain how these factors will affect the vote winning margin.[12]

In addition to incorporating fixed effects to control for all state-specific and time-invariant differences across states, we also include a time variable, election year, to account for the effects on the winning margin that arise across time and are common to all states. In its most general form, the model used to test the BPS model is:

$$Winning\ margin_{it} = \alpha_{it} + \alpha_2 ASSL_{it} + \alpha_3 Voter\ turnout_{it} + \alpha_4 Vol\_CV_{it} + \alpha_5 Coalition_{it} + \alpha_6 President_{it} + \alpha_7 Election\ year_t + \varepsilon_{it}, \quad j = 1, \ldots, 14;\ t = 1957, \ldots., 2018.$$

where α_2 is predicted to be positive, α_3 and α_4 negative, α_{it} is a state fixed effect and ε_{it} is a white noise random variable. The coefficients α_5 and α_6 are unsigned ex ante while the sign of α_7 will capture the effect of any time trend to electoral competitiveness across Indian states.[13] The use of fixed effects is suggested by the existence of widespread differences across India's major 14 states that are not easy to measure, allowing the regression results to account for systematic effects that might arise among our 14 Indian states. The descriptive statistics of our variables and the equation used to instrument voter turnout are included in the Data Appendix to the paper.

4. Results

a. Fixed effects models with and without voter turnout instrumented

[12] In India, both pre- and post-election coalitions are formed. In pre-election coalitions parties agree not to compete against each other in the same constituencies, whereas in post-election coalitions they do. We expect winning margin to be lower for the post-election coalitions and higher for the pre-election coalitions. Since the available data does not allow us to distinguish between coalition types, we cannot predict the coefficient sign of Coalition. Presidential rule is sometimes imposed because of internal political instability and sometimes as a central government intervention for other political reasons. While the imposition of presidential rule in itself does not allow us to distinguish the precise reason, we recognize its importance but do not predict its sign.

[13] Time dummies would usually be used to control for time-specific, state-invariant factors. In our case, however, 61 time dummies would be needed which would severely reduce the degrees of freedom (as our analysis includes 152 state elections). To preserve degrees of freedom, we have used a time trend. To address a similar issue, Ferris and Dash (2022) divided the period of study into 5-year cycles and used dummies for these cycles while studying the evolution of party structure of Indian states. The results estimated with their method do not vary much from our time trend specification.

In Table 1 we present the coefficient estimates of a set of fixed effects panel models of the winning first versus second vote share margin arising in our 14 major Indian states. Column (1) presents the results for a truncated version of the model without controls when contemporaneous voter turnout is used. This is presented to contrast with the results in column (2) and thereafter where actual voter turnout in the truncated model is replaced with its instrumented value. Both models concur in finding all coefficient estimates consistent with their expected sign but with only the coefficients on voter turnout and the distribution of party vote volatility significantly different from zero at the 1 percent level. While the data suggests that an increase in asymmetrically adjusted safe seats is associated with an increase in the size of the winning margin, that effect is not found to be significantly different from zero. This pattern is replicated in all other versions of our test. The use of instrumented voter turnout in column (2) to control for endogeneity improves somewhat the fit of the model, significantly increasing the size of the estimated effect of voter turnout on winning margins while lowering somewhat the measured effect of vote volatility.

--insert Table 1 about here--

The controls are introduced in two stages. In column (3) the two controls for party structure differences are introduced and while their presence increases the explanatory power of the overall model, their presence does not significantly change the coefficient estimates of the primary determinants found in column (2). Of the two added variables, only control for the presence of a coalition government is found to be significant, decreasing the size of the winning margin.[14] Presidential rule is found to have no significance in this form of the test.

In column (4) a common time trend across states is introduced and the statistically significant negative coefficient estimate suggests that electoral competitiveness in Indian states has increased over time. This complements existing studies which have found that the structure of party politics in India, as measured in terms of the effective number of parties (ENP), has become more competitive (see, for example, Chhibber and Kollman (1998), Yadav and Palshikar (2003), Dash and Mukherjee (2015), and Dash et al (2019)). The presence of the time

[14] Indian state elections often feature 100 or more competing parties most of which will have only minimal success. The resulting fragment of the vote tends to reduce effective opposition to the governing party(ies). The negative coefficient suggests that the consolidation of parties into coalitions increases the effectiveness of party competition as indicated by lower winning margins. See Ferris and Dash (2022).

trend has also resulted in an increase in the significance of presidential rule. In this form of the test all variables have their expected sign and all covariates but for ASSL are significantly different from zero.

It follows that the predictions of our extension of the BPS model receive substantial support for our set of Indian states. Two of the three specific model predictions with respect to political competition receive consistent support while the third prediction is not contradicted by the data. More specifically, for this set of 14 Indian states over the 1957 to 2018 time period, state assembly elections have closer outcomes when voter turnout is higher and the distribution of constituency vote volatilities (as measured by its coefficient of variation) rises. Increases in asymmetrically adjusted safe seats are associated with less competitive elections as measured by winning margins, but not significantly so.

b. Fixed effects models grouping states by stage of development and adaptive constituency-based coefficient of vote volatility

In this section we examine the robustness of these results by incorporating two additional issues. First, the significance of noneconomic heterogeneity, as measured by the distribution of constituency vote volatilities, is only partially predetermined prior to the time of an election.[15] To better account for the potential endogeneity that arises from its interaction with electoral competitiveness and winning margins we recalculate the coefficient of constituency vote variations as an adaptive measure, called Adapt_Vol_CV. In effect the test moves from imposing a form of rational expectations to assuming that expectations are based in part on past realizations.[16] Second, many writers on India have noted the dramatic differences that arise across Indian states and have found significant differences in the ways that political parties compete and voters participate in states at different stages of development.[17] Using the BIMAROU versus Non-BIMAROU categorization of states to represent different stages of development, we ask whether our model of electoral

[15] We also experimented with the use of a gini coefficient measure of the distribution of constituency volatilities which produced results similar to those for the coefficient of variation. These results are available upon request.
[16] The constituency-based measure is constructed by weighing each constituencies contemporaneous vote volatility and its last election's volatility equally to form the distribution upon which the coefficient of variation is calculated.
[17] For recent examples see Pandya and Maind (2017), Santra and Das (2018), Vikas (2018), Dash et al (2019), Winer et al (2021) and Ferris and Dash (2021).

competition using winning margins responds differently across this grouping.[18] The results are presented in Table 2.

In column (1) of Table 2 the model results of using the adaptive coefficient of volatility variation, Adapt_Vol_CV, instead of its contemporaneous value, Vol_CV, is presented for our full set of 14 states. Comparison with column (3) of Table 1 indicates that the removal of some degree of endogeneity has resulted in an increase in measured response of the winning margin [the coefficient estimates on the adaptive measure rise (in absolute value) from -0.033 to -0.046 while the explanatory power of the equation does not change much]. The use of the adaptive value has left the other control coefficient estimates and their significance largely unchanged.

--Table 2 about here --

The results of running the model separately for the BIMAROU and Non-BIMAROU states suggest important differences across the two groupings. First, the BPS model fits the data in all its dimensions much better for the BIMAROU states in column (2) than for Non-BIMAROU states in column (3). The model as applied to the BIMAROU states explains seventy percent of the within state variation of winning margins versus thirty seven percent in Non-BIMAROU states. In terms of the individual predictions, it is only in the BIMAROU states where the expected linkage between winning margins and asymmetrically adjusted safe seats (ASSL) is found to be both positive and statistically significant. Perhaps because of the larger incidence of reserved seats for scheduled castes and tribes in BIMAROU state legislatures, the committed-uncommitted feature of the BPS model may apply more naturally.[19] The data conforms to the expected effect of greater voter turnout increasing electoral competitiveness equally well in both development groupings while the salience of noneconomic factors, as

[18] Most writers have used either a four or five state grouping to categorize the poorest set of Indian states. The use of the term, BIMAR(O)U, refers to the initials of the poorer states: Bihar, Madhya Pradesh, Rajasthan, (Odisha) and Uttar Pradesh. In our sample period the lesser developed BIMAROU states had: a per capita income roughly one half of that in Non-BIMAROU states, a degree of urbanization roughly one half of non-BIMAROU states and a literacy rate only three quarters of that in Non-BIMAROU states.

[19] Electoral impacts of reserving seats for the Scheduled Castes (SCs) and the Scheduled Tribes (STs) in Indian state elections have been analyzed by many scholars. For example, Auerbach and Ziegfeld (2020) and Ferris and Dash (2022) find that the number of competing parties (both major and minor) in reserved constituencies are smaller compared to the unreserved ones. Similarly, Jensenius (2017) finds that the vote margins of victory is higher, and voter turnout rates and numbers of candidates contest elections are lower in constituencies reserved for SCs compared to unreserved ones.

proxied by Adapt_Vol_CV, is consistent with the predicted relationship for both state groupings but significantly so only for the less developed BIMAROU states. Time trend emerges as negative and significant only for the Non-BIMAROU states, suggesting that electoral outcomes have become more competitive only among the developed Indian states.[20] Overall these results complement the growing literature that highlights the important differences in election characteristics across BIMAROU and Non-BIMAROU state groupings and their consequences for political competition in India.

5. Conclusion

In this paper we have proposed a test of an extension of the Besley, Persson and Strum committed/uncommitted voter model that includes voter turnout and incorporates a new measure of the salience of noneconomic issues. The results found evidence within Indian states that is supportive of at least two of its three key hypotheses. Electoral competitiveness, in the sense of a smaller first versus second place winning vote share margin, is found to be larger the larger voter turnout is expected to be and the larger is variation of vote volatility across the constituencies. There is also a suggestion in the data that competitiveness is stronger when electoral safe seats are more symmetrically distributed among the major competing parties, but this result is not found to be statistically significant overall. However, when the model is run over a bifurcated panel where states are grouped by their development status, the model is found to fit the data best for the BIMAROU grouping of poorest Indian states and in this case asymmetrically distributed safe seats emerge as a significant deterrent to electoral competition.

[20] As an alternative to the 5/9 grouping of BIMAROU and Non-BIMAROU states, we also estimated using the 4/10 grouping of BIMARU and Non-BIMARU states where Odisha becomes part of the latter grouping. The results remain more or less the same. These results are available on request.

References

Auerbach, A.M., and A. Ziegfeld (2020). How do electoral quotas influence political competition? Evidence from municipal, state, and national elections in India. *Journal of Politics* 82(1): 397-401.

Besley, T., T. Persson and D. M. Sturm (2005). Political competition and economic performance: Theory and evidence from the United States. *National Bureau of Economic Research Working Paper* 11484.

Besley, T., T. Persson and D. M. Sturm (2010). Political competition, policy and growth: Theory and evidence from the US. *Review of Economic Studies* 77: 1329-1352.

Bierbrauer, F., A. Tsyvinski and N. Werquin (2022). Taxes and Turnout: When the Decisive Voter Stays at Home. *American Economic Review* 112(2): 689-719.

Chhibber, P.K., and K. Kollman (1998). Party aggregation and the number of parties in India and the United States. *American Political Science Review* 92(2): 329-342.

Dash, B.B., and J.S. Ferris (2021). Economic performance and electoral volatility: Testing the economic voting hypothesis on Indian states, 1957–2013. *Party Politics* 27(6): 1105-1119.

Dash, B.B., J.S. Ferris and M.C. Voia (2021). Does income Inequality enter into an aggregate model of voter turnout? Evidence from Canada and Indian States. *Carleton Economic Working Paper*: 21-09.

Dash, B.B., J.S. Ferris and S.L. Winer (2019). The measurement of electoral competition, with application to Indian States. *Electoral Studies* 62, 102070.

Dash, B.B., and S. Mukherjee (2015). Political competition and human development: Evidence from the Indian States. *Journal of Development Studies* 51: 1-14.

Ferris, J.S., S.L. Winer and B. Grofman (2016). The Duverger-Demsetz Perspective on Electoral Competitiveness and Fragmentation: with application to the Canadian Parliamentary System, 1867 – 2011" in M. Gallego and N. Schonfield (eds.), *The Political Economy of Social Choices*, 2016, New York: Springer Publishing: 93-122.

Ferris, J.S., and B.B. Dash (2022). On the Structure of the Political Party System in Indian States, 1957-2018. *Constitutional Political Economy*, online at https://doi.org/10.1007/s10602-021-09358-2.

Geys, B. (2006). Rational theories of voter turnout: A review. *Political Studies Review* 4(1): 16-35.

Green, K.F. (2020). Campaign effects and the elusive swing voter in modern machine politics. *Comparative Political Science* 54(1): 77-109.

Jensenius, F. (2017). *Social justice through inclusion: The consequences of electoral quotas in India*. Oxford University Press.

Matsusaka, J.G. (1993). Election closeness and voter turnout: Evidence from California ballot propositions. *Public Choice* 76**:** 313-334.

Pandya, F., and S. Maind (2017). Panel data analysis: convergence of Indian states with infrastructure. *Journal of Social and Economic Development* 19: 181–195.

Pedersen, M.N. (1979). The dynamics of European party systems: Changing patterns of electoral volatility. *European Journal of Political Research* 7(1): 1-26.

Profeta, P. (2002). Retirement and Social Security in a Probabilistic Voting Model. *International Tax and Public Finance* 9: 331-348.

Profeta, P. (2007). Political support and tax reforms with an application to Italy. *Public Choice* 131: 141-155.

Przeworski, A. and J. Sprague (1971). Concepts in search of explicit formulation: A study in measurement. *Midwest Journal of Political Science* 15(2): 183-218.

Piwowarski, R. (2015). Swing voters distribution into the income groups in Poland in the years 2001-2011: Probabilistic voting model perspective. *Ekonomia Journal*, Faculty of Economic Sciences, University of Warsaw, vol. 40.

Santra, S. and S. Das (2018). Do we share the same destiny? An empirical study of the convergence of growth among Indian Sates. In Dasgupta R. (ed.) *Advances in Growth Curve and Structural Equation Modeling*, pp. 59-70. Springer, Singapore.

Selway, J.S. (2021). Electoral rules, social structure, an public goods provision: Outcomes, spending and policies. *Studies in Comparative International Development* 56: 384-411.

Vikas, Y. (2018). Trends of demographic development of BIMARU states in India. *International Journal of Research in Social Sciences* 8(8): 189-210.

Winer, S.L., J.S. Ferris, B.B. Dash and P. Chakraborty (2021). The privateness of public expenditure: A model and empirics for the Indian States. *International Tax and Public Finance* 28: 1430-1471.

Yadav, Y., and S. Palshikar (2003). From hegemony to convergence: Party system and electoral politics in the Indian States, 1952–2002. *Journal of Indian School of Political Economy* 15(1-2): 5-44.

Data Appendix

A. Data sources and descriptive statistics

Our dataset covers state elections from 1957 to 2018 spread across 14 major Indian states: Andhra Pradesh, Bihar, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal. Though an elected party/coalition can govern a state up to a maximum period of 5 years, the governing party/coalition will not always complete its tenure. In the event of the governing party/coalition losing the confidence of the assembly, elections will be held before its due date. As a result of this, the numbers of elections held during the period of this study vary from state to state: 12 in Haryana and Maharashtra to 16 in Uttar Pradesh.

The Election Commission of India (ECI) maintains the records of both national (parliamentary) and state (assembly) elections on their website: https://eci.gov.in/elections/election/. Using information provided in ECI's reports, Dash et al. (2019), Dash and Ferris (2021) and Winer et al. (2021) have constructed all the variables used in this study. Dash et al. (2019) discuss the methodologies of constructing the constituency-based electoral measures in greater detail. Their datasets end at the assembly elections of 2013. We have updated their datasets to 2018. Table A1 presents the descriptive statistics of all variables used in this study.

Table A1
Descriptive Statistics (14 Indian State Averages, 1957 – 2018)

Variable definitions	Mnemonics used in tables	Obs.	Mean	Std. Dev.	Min.	Max.
Vote share margin between winning and runners-up candidate	**Winning margin**	195	.145	.046	.06	.29
Asymmetrically adjusted safe seats in the legislature	**ASSL**	152	.118	.075	0	.33
Voter turnout at the state level	**Voter turnout**	195	.627	.109	.24	.86
Instrumented voter turnout at the state level	**Instrumented voter turnout**	179	.635	.070	.190	.771
Coefficient of variation of constituency volatilities	**Vol_CV**	180	.494	.181	.18	1.17
Coefficient of variation of constituency adaptive volatilities	**Adapt_Vol_CV**	166	.386	.138	.15	.81
Dummy variable: = 1 for the coalition government; = 0 otherwise	**Coalition**	195	.369	.484	0	1
Dummy variable: = 1 for the Presidential Rule; = 0 otherwise	**President**	195	.231	.422	0	1

States included: Andhra Pradesh, Bihar, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal

B. Instrumental Variable equation from Dash, Ferris and Voia (2021).

Voter Turnout = .325Turnout(-1) -.004PC_income growth +.009District Size - .0000002District Size^2 -.088Constituency_Volatility +4.75Gini -6.97Gini^2 -.227Winning margin +.0003Party numbers -.044Presidential rule +.002Old(60+) -.005Lowered voting age - .438Election1992_Punjab - .371

Tables used in the text

Table 1

Fixed Effects Panel Regressions of the Winning Vote Share Margin:
14 Indian States, 1971 – 2018[t]

	Winning margin (1)	Winning margin (2)	Winning margin (3)	Winning margin (4)
ASSL	0.0057 (0.053)	0.0057 (0.050)	0.0026 (0.050)	0.0048 (0.049)
Voter turnout	-0.224*** (0.031)			
Instrumented voter turnout		-0.341*** (0.068)	-0.372*** (0.112)	-0.286*** (0.093)
Vol_CV	-0.064*** (0.021)	-0.043** (0.025)	-0.039** (0.015)	-0.033** (0.015)
Coalition			-0.017*** (0.005)	-0.016*** (0.005)
President			-0.011 (0.009)	-0.017** (0.006)
Election year				-0.0008** (0.0003)
Constant	0.316*** (0.014)	0.38*** (0.041)	0.408*** (0.071)	1.93*** (0.600)
Statistics Observations R-square F test AIC value	 152 0.291 70.4*** -585.6	 152 0.365 19.6*** -602.4	 152 0.403 11.3*** -607.8	 152 0.446 27.99*** -617.3

Robust standard errors in brackets, ***(**)[*], signify significance at 1% (5%)[10%].

[t] Three early election outcomes were needed to construct asymmetrically adjusted safe seats (ASSL) which reduces our panel regression coverage from 1957–2018 to 1971-2018.

Table 2

Fixed Effects Models of the Winning Vote Share Margin:
14 Indian States and by Stage of Development, 1971 – 2018

	Winning margin All 14 States (1)	Winning margin 5 BIMAROU States (2)	Winning margin 9 Non-BIMAROU States (3)
ASSL	0.020 (0.054)	0.243** (0.074)	-0.060 (0.046)
Instrumented voter turnout	-0.289*** (0.095)	-0.387* (0.184)	-0.271** (0.088)
Adapt_Vol_CV	-0.046* (0.024)	-0.123*** (0.022)	-0.007 (0.021)
Coalition	-0.017*** (0.005)	-0.017** (0.007)	-0.011* (0.005)
President	-0.017** (0.006)	-0.019 (0.010)	-0.013 (0.009)
Election year	-0.0008** (0.0003)	-0.0004 (0.0007)	-0.0008** (0.0003)
Constant	1.90*** (0.581)	1.14 (1.26)	1.98*** (0.590)
Statistics Observations R-square F test AIC value	 152 .445 27.45*** -617.0	 57 .703 11.4*** -265.9	 95 .373 27.0*** -367.2

Robust standard errors in brackets, ***(**)[*] signify significance at 1% (5%)[10%].
BIMAROU refers to a collection of 5 states with significantly lower levels of development, characterized by significantly lower income levels, lower life spans and lower literacy rates than the other 9 states in our sample of Indian states. See footnote 18 in the text for a more detailed discussion on this classification.