THE POLITICAL DETERMINANTS OF PUBLIC GOODS PROVISION IN THE STATES OF INDIA: AN EMPIRICAL INVESTIGATION

Dissertation submitted to the Jawaharlal Nehru University in partial fulfillments of the requirements for the award of the degree of MASTER OF PHILOSOPHY

By

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DECLARATION

I declare that the dissertation entitled "**The Political Determinants of Public Goods Provision in the States of India: An Empirical Investigation**" submitted by me for the award of the degree of **Master of Philosophy** (**M. Phil.**) of Jawaharlal Nehru University is my own work. The dissertation has not been submitted for any other degree of this University or any other university.

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CERTIFICATE

We recommend that this dissertation be placed before the examiners for evaluation.

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Dedicated

To

My Dearest Parents...

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The Political Determinants of Public Goods Provision in the States of India: An Empirical Investigation

1 Introduction

What determines the provision of public goods in a society? While the traditional public finance literature answers this question from alternative perspectives, it is always assumed that the government provides the public goods *and* that the government is a benevolent social planner, interested in maximizing the representative citizen's welfare. In contrast, the recent literature on political economy emphasizes the institutional constraints under which policies are formulated. It argues that policy-makers are typically political parties or politicians. Naturally, the public goods related decisions that are undertaken are tempered by political factors.

This paper tests some of the political economy theories of government behavior in the context of a developing country. Specifically, I have examined 14 major states of India over 34 financial years (1967-68 to 2000-01). The major question arises out of the study is that whether the proximity of a state legislative assembly election or the level of political competition or the effective number of parties in a legislature affects public goods provision in the states of India?

There is a vast literature that uses data from developed countries to test the presence of electoral and other political considerations in government behavior. This literature has scarcely been extended to developing countries (Schuknecht (2000), Block (2002), Shi and Svensson (2002a, b), and Khemani (2004) are recent and notable exceptions). There is an obvious reason for the lacuna – democratic institutions have only very recently taken root in developing countries. India, on the other hand, has been a democracy since its independence in 1947, and periodic elections to the national and state legislative assemblies have been taking place since 1952. Therefore, the Indian experience sheds light on political economy models in the context of a developing country with long-standing democratic traditions.[1]

I now briefly outline the theoretical arguments that provide the rationale for my empirical investigation. Beginning with Nordhaus (1975), several theoretical papers have explored the interactions between election timing and governments' policy choices. Specifically, Rogoff (1990) assumes that an opportunistic incumbent government seeks to remain in power. Furthermore, the government is assumed to incur expenditures of two

[1] Khemani (2004) makes this point as well.

sorts: public consumption and public investment. Since the effects of public investment are imperfectly observed by voters, the government signals its competency to voters by shifting expenditures in favor of consumption and against investment in an election year. This means that public goods provision should be lower in an election year relative to all other years.

A separate theoretical strand of the political economy literature emphasizes the connection between the effective number of parties in a legislature and the provision of public goods. Specifically, Persson and Tabellini (1999) argue that as the effective number of parties increases, each political party seeks to win by targeting benefits to a decreasing vote base. This means of course that as the vote base decreases, public goods become an inefficient way of transferring benefits. Since, by definition, the gains from such provision are not restricted to the vote base being targeted. Summing up, an increase in the effective number of parties lowers the provision of public goods.

Yet, another branch of political economy literature informally draws a link between political competition and public goods provision. It is argued that when political competition is absent, the incumbent government has little fear of electoral defeat with its future being secure. So, there is little incentive to worry about the provision of public goods. In contrast, when political competition is severe, the desire to garner votes in an election forces an incumbent government to cater citizens' demands for public goods. This theory therefore critiques a positive link between the degree of political competition and the provision of public goods.

My work is directly linked to three papers that use data from India to test political economy models of government behavior. Khemani (2004) examines the impact of state legislative assembly elections on the provision of National highway and state roads (other roads constructed by state Public Works Departments). Khemani shows that National highway construction increases substantially in election years but there is no significant effect of elections on state roads, which contradict the predictions of Rogoff (1990). I have arrived at the same conclusion as Khemani with different set of variables (public goods as well as political variables), making the result robust in the Indian context. Steven I. Wilkinson (2006) tests the impact of political competition on the provision of infrastructure. He measures political competition by electoral volatility and it is the total

net change in party votes at each election, divided by 0.5. He finds that a rise in electoral volatility in a state has a significant positive effect on state road spending and state road building. Although there exists a difference in terms of the measure of political competition and the set of variables chosen, I have also got a similar significant positive effect, which may be a robust result for India. Pradeep Chhibber and Irfan Nooruddin (2004) have analyzed the effects of effective number of parties (party system) on the delivery of public goods. Their results show that the state government's development expenditure (a public good) increases when the effective number of parties is two (two-party system) and expenditure on salaries (a club good) increases when the number of effective parties is greater than two (multi-party system). With a different data source and different set of variables my study supports their results, making it robust for India.

The principal findings of my study are as follows. First, in the election years, there is a decrease in irrigation-related investment. This comports with the theory developed by Rogoff (1990) which maintains that elections lower capital goods investment. Second, an increase in the political competitiveness raises the provision of roads and provision of irrigation through wells. Third, an increase in the effective number of parties has a negative impact on provision of irrigation through wells, roads and power. This result is in agreement with the theory that a proliferation of political parties in a system provides a disincentive for public goods provision.

The remainder of the paper is structured as follows. Section 2 provides a description of the data set used in the analysis. Section 3 presents both the econometric procedures employed and the empirical results obtained. Section 4 concludes and suggests directions for future research in this area. Section 5 briefly considers the robustness of the empirical results given in section 3.

2 The data

The data set for my study consists of annual observations spanning 34 financial years (1967-68 to 2000-01) for the 14 major states of India.[2] India comprises 28 states and seven union territories. In the financial year 2000-01, the aforementioned 14 states

[2]The fourteen major states are as follows: Andhra Pradesh, Bihar, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal.

accounted for 83.12 percent of India's land area, 87.43 percent of her population, and 76.62 percent of the gross domestic product.

The provision of various types of public goods (e.g., per capita gross power generated) serves as dependent variable in my empirical analysis. The set of explanatory variables are partitioned into two distinct categories. The first category, referred to as *political variables* (e.g., political competition), measures political attributes of states that are likely to influence public goods provision. The second category, referred to as *non-political variables*, measures ostensibly non-political attributes of states (e.g., per capita state domestic product) that capture the need for public goods provision. The rest of the section is split into three parts containing a discussion of the three categories of variables: public goods variables, political variables, and non-political variables.

2.1 Public goods

The public goods that I have considered are of three types: provision of roads, generation of power, and irrigation.[3] Examine first the provision of roads. Three variables under this category are considered: the length of urban roads (in kms), the length of Panchayat Samiti roads (in kms), and the total road length (in kms).[4] The power variable, that I have studied, is the per capita gross power generated from all sources of power (e.g., hydro, steam); the unit is crore kwh per person. Finally, I have incorporated three irrigation-related variables: net area of a state irrigated by canals, net area irrigated by wells, and net area irrigated from all sources (government canals, tanks, wells and other sources).[5]

For each of the seven dependent variables, Table 1 provides state-specific means and standard deviations. These are computed over the financial years 1967-68 to 2000-01 and are arrayed by state. Table 1 documents the enormous across-state variation in the levels of public goods provision by the state governments. For example, the average total road length in Uttar Pradesh is 181918 km (high) and in Haryana the corresponding value is 21863.3 km (low). The average proportion of state arable land, that is irrigated, is 0.614

[3]The regressions I run actually logs the public goods data.
[4]The data are taken from various issues of *Basic Road Statistics of India*, a Government of India publication, and *Infrastructure in India*, published by Centre for Monitoring Indian Economy.
[5]The data on power and irrigation are taken from various issues of *Statistical Abstract of India*, a Government of India publication.

in Haryana (high) and 0.14 in Kerala (low). The average per capita gross power generated is 413.4 crore kwh in Gujarat (high) and 33.7 crore kwh in Bihar (low).

2.2 Political variables

This paper emphasizes on the political determinants of the public goods provisions in the states of India. In this context, I ask the following question: Does the proximity of a state legislative assembly election or the degree of political competition or the effective number of parties affect the public goods provision? Before going into the details of the discussion, I have discussed the construction of political variables[6] (election year dummy, political competition variables, and effective parties variable) in the following three sub-sections.

2.2.1 Election year dummy

In order to examine how the proximity of a state legislative assembly election affects the provision of public goods in a particular state, election year dummy is constructed as follows: the election year dummy in a state-year (s, t)[7] is denoted by $Elec_{st}$ and it is a zero-one variable that equals one, if financial year t is a scheduled election year in state s, otherwise zero.

The treatment of elections merits scrutiny. First, some rule must be specified as to when a financial year t is deemed to be an election year in state s. Following Alesina et al. (1993) and Reid (1998), financial year t is called an election year in state s, if a state legislative assembly election is held in the second half of financial year t or in the first half of the next financial year.

A more serious problem pertains to the potential endogeneity of elections.[8] The constitution of India mandates that a state legislative assembly has a normal term of five

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[6]Vidhan Sabha constituency-level electoral data downloaded from the website of the *Election Commission of India* (*http: eci.gov.in/*). The schedules of all state legislative assembly elections are taken from the book *India Decides* (1996).

[7]Note that I use "state-year (s, t)" as shorthand for "state-financial year (s, t)."

[8]The possibility of election endogeneity in a parliamentary system has been recognized by several researchers: Cargill and Hutchison (1991) explored this issue in the case of Japan, Chowdhury (1993) and Khemani (2004) focus on India, Heckelman and Berument (1998) study both Japan and the United Kingdom, while Reid (1998) looks at the Canadian situation.

years from the date appointed for its first sitting. Accordingly, I have classified a state legislative assembly election as *scheduled* if it is held when the current assembly is at least four years of age. In the dataset, the fourteen states have experienced an aggregate of 119 assembly elections; 71 of these elections are classified as *scheduled*. What accounts for the remaining 48 *mid-term* elections?

Three circumstances lead to *mid-term* elections. First, a state government may lose the confidence of a majority in the state legislature. The Governor of the state, upon verifying that, no claimant can form an alternative government commanding majority support, conventionally calls for fresh elections. Second, the President of India, upon receipt of a report by the Governor of a state or otherwise, may be satisfied that constitutional breakdown has occurred at the state level. This leads to the temporary imposition of President's Rule and, eventually, fresh elections. Third, a state government may voluntarily petition the Governor of the state to hold *mid-term* elections.

The third reason for *mid-term* elections is especially problematic. If the incumbent state government strategically holds elections for electoral gains, then election timing may be correlated with shocks to public goods provision. Following Khemani (2004) and Shi and Svensson (2002a, b), my empirical analysis therefore sets $Elec_{st}$ to 1, only if a scheduled election takes place in state-year (s, t). In other words, my empirical work differentiates scheduled election years from all other years.

2.2.2 Political competition variables

Consider, now, how I create the political competition variables that indicate whether a state-year (s, t) is competitive or not. I begin by assuming that the decisions regarding the provision of public goods in state s for financial year t are made at the very beginning of that financial year (that is, March 31 of financial year (t-1)) using state electoral outcome information from the *last* Vidhan Sabha election.

The construction of the political competition variables proceeds as follows. Given state-year (s, t), I have identified the *last* Vidhan Sabha election occurring in state s prior to financial year t.[9] Now, for Vidhan Sabha election, I have observed the vote shares of

[9]For example, consider the financial year 1968-69. To obtain the competitive measures, I identify the last Vidhan Sabha election occurring before March 31, 1968.

the contesting political parties in each of the electoral constituencies of state *s*. So, for each election, I first define a winning margin, which for electoral constituency *i*[10], is the difference in the percentage vote shares of the two political parties that secure the highest number of votes in constituency *i*. Then, I have classified the electoral constituency *i* as a 'competitive' constituency, if it's winning margin value is less than or equal to the cut off value of one percent. Let $Propcomp01_{st}$ denote the proportion of such competitive constituencies in state *s* in the identified Vidhan Sabha election. Additionally, I have created variables $Propcomp02_{st}$, $Propcomp03_{st}$, and $Propcomp05_{st}$ as the proportion of constituencies in state *s* that have winning margin values less than or equal to two percent, three percent and five percent respectively, in the identified Vidhan Sabha election. These cut off values capture the '*competitiveness*' of the race in a constituency when multiple parties (two or more) contest the election.

The state-specific means of four 'proportion competitive constituencies' variables – that is, *Propcomp01*, *Propcomp02*, *Propcomp03*, and *Propcomp05* – are provided in Table 2. Column [1] shows that over the sample period, in the states of Haryana, Kerala, and Uttar Pradesh, over six percent of constituencies witnessed elections in which the winning margin was not more than one percent; in contrast, the corresponding number for Gujarat is less than three percent. Column [2] raises the winning margin to two percent. Notice that, over the sample period, more than 13 percent of constituencies in Kerala witnessed elections wherein the winning margin was not more than two percent. Since Vidhan Sabha elections primarily center on local issues, 'small' political parties with narrow and localized support bases often contest Vidhan Sabha elections. The spreading of votes over a larger set of contending political parties makes the winning margin in Vidhan Sabha elections on an average lower. This is best seen by considering the

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[10]Let there be *N* political parties contending a Vidhan Sabha election in electoral constituency *i* of state *s*. Let the votes received by party 1 be v_1, the votes received by party 2 be v_2, and so on. If party 1 is the highest vote-getter in constituency *i* and party 2 is the second highest vote-getter in constituency *i*, then winning margin for constituency *i* in the Vidhan Sabha election under review is $100*(v_1-v_2)/\sum_{j=1}^{N} v_j$. Where $\sum_{j=1}^{N} v_j$ is the total voter turnout by eligible voting population of constituency *i*. I use this total voter turnout as the denominator in the calculation of winning margin value since there may be concerns regarding the possible endogeneity of the voter turnout variable. However, in the Indian context this is unlikely to be a serious problem; Ghosh (2006) for example shows that electoral turnout in Lok Sabha constituencies is not robustly explained by the predicted closeness of the election.

proportion of Vidhan Sabha competitive constituencies averaged over the 14 states in this study: with the winning margin set at one percent, two percent, three percent, and five percent, the proportions of Vidhan Sabha competitive constituencies in the 14 states are 0.045, 0.090, 0.136, and 0.224 respectively.

Vidhan Sabha elections in Bihar and Uttar Pradesh are multi-party contests and a small vote swing in favor of any one political party leads to vast changes in the seat shares of the contending parties. Vidhan Sabha elections in Kerala, on the other hand, have centered on two pre-poll alliances – one alliance is led by the Congress Party while the other is led by the Communist Party of India (Marxists). Over the years, the electoral margins have been razor thin and the two alliances have taken turns in forming the state government.

2.2.3 Effective parties variable

In this section, my focus is on 'effective' number of parties rather than total number of parties in determining the delivery of public goods. Recall that this paper tests whether politicians engaged in two-party competition are more likely to provide public goods than those who are engaged in multi-party competition.

Fix a state-year (s, t). Recall that I have maintained that public goods provision in a state-year is determined by political considerations prevails on March 31 of financial year (t-1). So, to determine the effective number of parties in state-year (s, t), I first identify the *last* Vidhan Sabha election occurring in state s prior to financial year t. For constituency i, the effective number of parties (denoted n_i) is computed[11] as follows: $n_i = 1/\sum_{j=1}^{N} v_{ij}^2$, where v_{ij} is the proportion of votes received by the j-th party in constituency i, $i = 1,\ldots,M$ and $j = 1,\ldots,N$. The measure of effective number of parties for state-year (s, t), denoted $EffectiveParties_{st}$ is constructed by averaged the n_i measures across all the constituencies.

[11]Even if there exists various indices (e.g., Wildgen, 1971) to measure the number of "effective" parties, I have used Laakso-Taagepara Index (1979) due to its ease of calculation, its attractive theoretical properties (e.g., its link to the Herfindahl-Hirschman Index, and the fact that, when all the parties are of the same size, the effective number of parties equals the actual number of parties (i.e., n=N), and if all components expect one are zero, n=1).

The state-specific means and standard deviations of the effective parties variable are provided in Column [1] of Table 3. Column [1] shows that there is significant across-state variation in the number of parties that are competitive in a state. Vidhan Sabha constituencies in the states of Bihar, Haryana and Uttar Pradesh witnessed multi-party elections in which the values of the effective parties (that is, effective number of parties) are higher; in contrast, the corresponding value for Kerala is lower while Kerala has two parties competed for power (refer to Column [1] of Table 3). For example, the values of the effective parties in Bihar, Haryana, and Uttar Pradesh are, respectively, 3.585, 3.137, and 3.550 while in Kerala the corresponding value is 2.249.

2.3 Non-political variables

The set of 'non-political variables' comprises of three variables: per capita state domestic product at constant prices (1970-71 rupees), the share of agriculture in state domestic product, and proportion of state population characterized as scheduled caste or scheduled tribe.[12] Summary statistics for these variables are given in Column [2] to [4] of Table 3.

The non-political variables are important as they represent constraints that any state government faces while making decisions on resource allocation. Citizens' demands for various public goods may vary with state per capita income. Variation in such demands will in turn lead to variation in public goods provision. Public investments may have greater value in industrial states (e.g., because of higher population density). This means of course, that a state's public goods provision and industrialization level may be positively related. Finally, scheduled castes and scheduled tribes represent historically backward and disadvantaged groupings of citizens; equity considerations by the state governments could induce a positive relationship between public goods provision and the share of such groups in the states' population. By using the political and non-political variables as regressors, I have asked whether the variables on which I have focused – the

[12]The data on real per capita state domestic product and the share of agriculture in state domestic product are taken from the *National Accounts Statistics*, published by the Central Statistical Organization. The *Census of India* provided state-wise data on total population, total scheduled caste and scheduled tribe population for the census year 1961,1971,1981,1991, and 2001. For the remaining years, the data are interpolated using a simple growth rate formula.

election year dummy, the political competition variables, and the effective parties variable – account for states' public goods provision once states' needs[13] are controlled.

3 Empirical results

Do political considerations (namely, the proximity of a state legislative assembly election, the extent of political competition, and the degree of party fragmentation) affect the public goods provision choices of state governments? To answer this question, I estimate the following log-linear model:

$$ln\,(p_{st}) = \beta' z_{st} + \gamma' x_{st} + \alpha_s + \delta_t + u_{st} \qquad (s = 1,\ldots, S;\ t = 1,\ldots, T) \qquad (1)$$

where p_{st} denotes a particular public goods provision (e.g., per capita gross power generation) in state s during financial year t, z_{st} is the vector of political variables, and x_{st} is the vector of non-political variables (e.g., per capita state domestic product). To account for unobserved state specific effects, I have included state specific dummies, α_s; similarly, time specific dummies, δ_t, are included to account for unobserved time specific effects. The model is estimated using ordinary least squares.[14] The resulting estimators are consistent, provided the unobserved state specific and time specific effects are sufficient to account for any possible correlation between the regressors and the error term. u_{st} is the error term and presumed to be orthogonal to all of the regressors.

How are the 'political variables' in equation (1) constructed? In section 2.2.2, I have described an array of variables (namely, $Propcomp01_{st}$, $Propcomp02_{st}$, $Propcomp03_{st}$, and $Propcomp05_{st}$) that measured political competition in state-year (s, t). From within this set, I first choose one variable and refer to the chosen variable as $Comp_{st}$. This done, the set of political variables in equation (1) consists of three variables: $Elec_{st}$, $Comp_{st}$, and $EffectiveParties_{st}$. Thus,

$$\beta' z_{st} = \beta_1 Elec_{st} + \beta_2 Comp_{st} + \beta_3 EffectiveParties_{st} \qquad (2)$$

[13]Non-political variables, viz. per capita state domestic product, share of agriculture in state domestic product, and proportion of state population characterized as scheduled caste or scheduled tribe, generate states' needs for public goods.

[14]This is the within-group regression.

My *basic* empirical model selects *Propcomp03* to be the Vidhan Sabha political competition variable (that is, *Comp*). Table 4 reports the regression results for the basic model.[15]Three conclusions follow from these results.

First, consider the effect of political competition. Notice that political competition affects the provision of irrigation through wells and the provision of all three varieties of roads. Contrast state-years of two kinds: in the first type, all constituencies are non-competitive (that is, the political competition measure assumes the value zero) while in the second type, all constituencies are competitive (that is, the political competition measure assumes the value one). Column [3] of Table 4 estimates show that the coefficient of the political competition variable is positively signed and statistically significant at the 10 percent level in case of area irrigated through wells. Column [3] also indicates that the proportion of arable land irrigated by wells in a state-year of the second type is 325.03 ((*exp*(1.447)-1)*100) percent higher than in a state-year of the first type. Observe also that political competition positively affects two measures of road infrastructure: total road length and urban road length. The coefficient of the political competition variable is statistically significant at the 5 percent level in both cases. Column [4] and Column [5] estimates depict that in a fully competitive state-year, total road length and urban road length are, respectively, 82.94 ((*exp*(0.604)-1)*100) percent and 184.34 ((*exp*(1.045)-1)*100) percent higher than in a fully non-competitive state-year. Curiously enough, an increase in political competition decreases Panchayat Samiti road length and the coefficient of the political competition variable is statistically significant at the 5 percent level. Perhaps, an increase in political competition leads to greater emphasis on road infrastructure in urban areas at the expense of rural areas in order to attract a large number of voters.[16] The magnitude of this effect is substantial. Column [6] estimates reveal that in a fully competitive state-year, Panchayat Samiti road length is 91.02 ((*exp*(-2.410)-1)*100) percent lower than in a fully non-competitive state-year.

[15]Given the focus of my paper, I only present the coefficient estimates related to the political variables in Table 4. The detailed results are available on request from the author.

[16]Due to higher population density in urban areas, it is easy for the politicians to campaign a large number of voters at a time by supplying particular public goods in urban areas.

I now discuss the effect of effective number of parties on the provision of public goods. Notice that the coefficient of the effective parties variable is negatively signed and statistically significant at conventional levels[17] in four cases: the proportion of arable land irrigated by wells, total road length, urban road length, and per capita gross power generation. This evidence is consistent with the theory that says that an increase in the number of political parties leads to a reduction in public goods provision.[18] It is also observed that the coefficient of the effective parties variable in case of Panchayat Samiti road length is positively signed and statistically significant at the 5 percent level. This may be due to the fact that Panchayat Samiti road is a very local issue and easily visible to voters. Thus, an increase in effective number of parties leads to increase in Panchayat Samiti road length. How large in magnitude is the effect of effective party number on public goods provision? Consider state-years of two kinds. In the first situation, the effective number of parties is two while in the second situation, the effective number of parties is three. The estimates of Column [3] to [5] and Column [7] show that the proportion of arable land irrigated by wells, total road length, urban road length, and per capita gross power generation are, respectively, 30.44 ((*exp*(-0.363)-1)*100) percent, 13.93 ((*exp*(-0.150)-1)*100) percent, 26.80 ((*exp*(-0.312)-1)*100) percent, and 13.32 ((*exp*(-0.143)-1)*100) percent lower in a three-party state-year than in a two-party state-year. Column [6] estimates show that Panchayat Samiti road length is 107.92 ((*exp* (0.732)-1)*100) percent higher in a three-party state-year than in a two-party state-year.

Consider, finally, how the proximity of scheduled election affects the provision of public goods related to irrigation: Column [1] to [3] of Table 4 estimates show that the coefficient of the election year dummy is negative and statistically significant at the 5 percent level in two cases: the proportion of arable land irrigated by all sources and the proportion of arable land irrigated through canals; specifically, the proportion of arable land irrigated by all sources and the proportion of arable land irrigated through canals are, respectively, 2.96 ((*exp*(-0.030)-1)*100) percent and 4.59 ((*exp*(-0.047)-1)*100) percent

[17]The coefficient of the effective parties variable is statistically significant at the 5 percent level in two cases: the proportion of arable land irrigated through wells and urban road length and significant at the 10 percent level for total road length and per capita gross power generation.

[18]As the number of effective parties increases, parties need only a plurality to win an election, parties focus on mobilizing smaller segments of the population and are more likely to use club goods rather than public goods to mobilize support.

lower in scheduled election years than in all other years. These results are consistent with the predictions of Rogoff (1990). Note that in sharp contrast to the predictions of Rogoff (1990), the coefficient of the election year dummy is positively signed and statistically significant at the 5 percent level when the proportion of arable land irrigated through wells is considered; specifically, the proportion of arable land irrigated through wells is 6.18 ((*exp*(0.060)-1)*100) percent higher in scheduled election years than in all other years.

To summarize, there is clear evidence that the public goods provision by state governments is influenced by political factors.

4 Conclusion

Using state level data from India, I have studied whether public goods provision of state governments is systematically affected by three political factors: the degree of political competition, the effective number of political parties in a parliamentary system, and the proximity of scheduled state elections. My empirical analysis shows that all the three political factors play an important role. Specifically, measures of road length and net area irrigated through wells in a state-year are affected by the political competitiveness in that state-year, measures of road length, power generation and net area irrigated through wells are impacted by the effective number of parties in a state-year, and the proximity of a scheduled state election affects irrigation-related variables.

Finally, I note that many empirical questions remain to be explored. I have tested but one half of the complete story. Specifically, while state governments' public goods provision was analyzed, voter behavior was unmodeled. Does the electorate, at the sub-national level, condition its vote on state governments' public goods provision? Some evidence, employing US data, already exists. Comparable work with Indian data is non-existent. In sum, the analysis of voter behavior in India remains a fruitful and unexplored research topic.

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5 Appendix

5.1 Robustness of results to measures of political competitiveness

The results reported in section 3 used a specific definition of political competition. Recall that I have considered a constituency to be competitive when the vote shares of the top two parties in that constituency differ by less than three percent. This three percent cutoff is of course arbitrary. So, I re-ran all the regressions using cutoffs set at one percent, two percent and five percent. Tables 5, 6 and 7 report the regression results for the above three cutoff values.

The results in Table 4 to 7 elicit several comments. First, the effects of the election year dummy are unaffected by how political competition is measured. Second, the impact of effective number of parties is virtually unchanged: indeed, only when the cutoff level for measuring political competition is raised to five percent, I have observed that power generation is unaffected by the effective number of parties. Finally, I have considered the impact of political competitiveness measure itself. Here too the results are stable with respect to alternative way of measuring political competition. Indeed, the results change only in three cases – when the threshold is set at one percent, political competition does not affect the provision of irrigation through wells and Panchayat Samiti roads; with the threshold raised to five percent, political competition does not affect Panchayat Samiti road length.

5.2 Robustness of results for the election year dummy

In section 3, the electoral cycle in public goods variables was estimated by considering scheduled election years only. The logical justification for this approach has previously given. What happens, however, when the regressions are re-run without differentiating between scheduled and mid-term elections?[19] Table 8 shows the regression results. Three observations are relevant here. First, the effects of effective number of parties are robust and do not depend on how the election year dummy is coded. Second, the impact of political competition is also robust and independent of coding of the election year dummy. Third, in section 3, I have noted election-year decrease in net area irrigated by

[19] Now, $Elec_{st}$ equals one, if an election (scheduled or mid-term) takes place in state s during the second half of financial year t or during the first half of the next financial year.

all sources and net area irrigated through canals, thereby consistent with the predictions of Rogoff (1990). I have also noted election-year increase in net area irrigated through wells, thereby contradicting the predictions of Rogoff (1990). Now, the electoral cycle in net area irrigated through canals and through wells disappears. Summing up, insofar as public goods variables are concerned, my empirical evidence supports to Rogoff (1990) *regardless* of how the election year dummy is coded.

Table 1: Descriptive statistics of public goods provision by the state governments in India

State	Total road length (in km)		Urban roads (in km)		Panchayat Samiti roads (in km)		Proportion of net area irrigated by all sources* in state arable land		Proportion of net area irrigated by government canals in state arable land		Proportion of net area irrigated by wells in state arable land		Per capita gross power generation (in crore kwh)	
	[1]		[2]		[3]		[4]		[5]		[6]		[7]	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Andhra Pradesh	132193	33426	9494.6	6243	39284	7698	0.26	0.04	-2.188	0.062	-2.733	0.423	230.9	103.9
Bihar	83054.3	4380	5604.1	3229	18716	180.1	0.296	0.094	-2.337	0.202	-2.231	0.469	33.7	7.151
Gujarat	70427	24266	9729.9	3007	10653	2342	0.217	0.062	-3.311	0.411	-1.853	0.327	413.4	170.4
Haryana	21863.3	6475	2528.1	1176	1450.5	962.4	0.614	0.115	-1.188	0.245	-1.331	0.326	352.6	72.09
Karnataka	117582	24866	8127.8	2444	20744	9307	0.151	0.041	-2.868	0.281	-3.163	0.426	237.4	83.33
Kerala	111000	28254	6043.2	3160	5023.7	1852	0.14	0.032	-2.981	0.336	-4.192	1.071	184.4	33.87
Madhya Pradesh	130774	43103	5340.2	2910	18922	16653	0.186	0.109	-2.820	0.389	-2.631	0.715	174.5	59.47
Maharashtra	180828	58635	14922		1361		0.105	0.024	-3.839	0.398	-2.823	0.296	403.1	143
Orissa	143704	74989	9113.7	3717	24025	8215	0.23	0.072	-2.194	0.341	-3.064	0.960	148.1	33.8
Punjab	95885.1	11586	5344.3	2635	33598	22506	0.514	0.082	-1.141	0.144	-0.709	0.170	359.1	216.6
Rajasthan	92025.5	33889	5295.2	1858	31475	13586	0.182	0.05	-2.892	0.210	-2.281	0.388	143.7	48.82
Tamil Nadu	142937	43769	9600.4	3100	45474	17876	0.338	0.042	-2.226	0.086	-1.998	0.211	230.4	106.5
Uttar Pradesh	181918	42568	26767	14497	39636	33922	0.513	0.108	-1.864	0.090	-1.451	1.450	116.1	28.15
West Bengal	62051.5	10009	13364	5710	14963	156.2	0.29	0.07	-2.188	0.219	-3.594	1.909	134.4	46.08

Notes:

(i) All of the public goods variables (described in section 2.1 of the paper) are in physical form and measured in their own- units. The sample period is financial year 1967-68 to 2000-01.

(ii) *Government canals, wells, tanks, and other sources.

Table 2: Descriptive statistics of competitive measures for Vidhan Sabha elections

State	Proportion of constituencies with winning margin			
	[1]	[2]	[3]	[4]
	$\leq 1\%$	$\leq 2\%$	$\leq 3\%$	$\leq 5\%$
Andhra Pradesh	0.040	0.074	0.113	0.202
Bihar	0.049	0.096	0.145	0.231
Gujarat	0.029	0.071	0.107	0.162
Haryana	0.063	0.111	0.164	0.255
Karnataka	0.039	0.080	0.122	0.204
Kerala	0.069	0.134	0.213	0.356
Madhya Pradesh	0.040	0.084	0.128	0.213
Maharashtra	0.033	0.068	0.105	0.188
Orissa	0.035	0.070	0.109	0.190
Punjab	0.043	0.094	0.149	0.247
Rajasthan	0.045	0.089	0.130	0.221
Tamil Nadu	0.038	0.079	0.114	0.178
Uttar Pradesh	0.070	0.128	0.183	0.295
West Bengal	0.039	0.081	0.115	0.190
Average	0.045	0.090	0.136	0.224

Notes:

(i) Column [1] ($\leq 1\%$), Column [2] ($\leq 2\%$), Column [3] ($\leq 3\%$), and Column [4] ($\leq 5\%$) show, respectively, the state-specific means of *Propcomp01*, *Propcomp02*, *Propcomp03*, and *Propcomp05*. (See text for details).

(ii) Column [1], [2], [3] and [4] have been fully described in section 2.2.2 of the paper. The sample period is financial year 1967-68 to 2000-01.

Table 3: Descriptive statistics of explanatory variables

State	Effective parties		Per capita state domestic product (in 1970-71 rupees)		Share of agriculture in state domestic product (percentage)	Share of state population characterized as scheduled caste or scheduled tribe
	[1]		[2]		[3]	[4]
	Mean	SD	Mean	SD	Mean	Mean
Andhra Pradesh	2.377	0.535	819.472	257.270	41.664	0.186
Bihar	3.585	1.198	453.720	53.983	44.241	0.201
Gujarat	2.541	0.595	1128.585	387.582	31.238	0.198
Haryana	3.137	0.937	1224.268	376.207	50.090	0.178
Karnataka	2.624	0.643	877.605	293.145	40.391	0.170
Kerala	2.249	0.254	713.392	177.940	35.676	0.097
Madhya Pradesh	2.740	0.818	562.515	103.551	45.664	0.328
Maharashtra	2.825	0.790	1192.339	413.388	23.163	0.157
Orissa	2.749	0.781	510.610	64.447	47.286	0.342
Punjab	2.596	0.621	1607.706	445.760	49.359	0.249
Rajasthan	2.667	0.863	701.774	192.999	47.661	0.264
Tamil Nadu	2.547	0.398	792.931	265.300	27.147	0.182
Uttar Pradesh	3.550	0.947	570.312	105.950	47.399	0.193
West Bengal	2.446	0.464	934.091	246.172	33.162	0.252

Notes: The effective parties variable is described in section 2.2.3 and all other variables are described in section 2.3 of the paper. The sample period is financial year 1967-68 to 2000-01.

Table 4: Impact of political factors on public goods provision

	Dependent variables						
	Irrigation (1)	Canals (2)	Wells (3)	Total roads (4)	Urban roads (5)	Panchayat Samiti roads (6)	Power (7)
Election year dummy	-0.030[a]	-0.047[a]	0.060[a]	-0.008	0.004	0.033	-0.023
	(2.52)	(2.06)	(2.13)	(0.59)	(0.09)	(0.14)	(1.10)
Effective parties	-0.002	0.064	-0.363[a]	-0.150[b]	-0.312[a]	0.732[a]	-0.143[b]
	(0.03)	(0.68)	(3.16)	(1.74)	(2.81)	(1.97)	(1.70)
Political competition	-0.024	-0.108	1.447[b]	0.604[a]	1.045[a]	-2.410[a]	- 0.063
	(0.05)	(0.15)	(1.78)	(1.96)	(2.11)	(2.40)	(0.14)
R-squared	0.94	0.92	0.78	0.94	0.86	0.66	0.95
Number of observations	415	371	368	459	387	136	364

Notes:

(i) "Irrigation" is the proportion of net area irrigated by all sources (government canals, tanks, wells and other sources) in state arable land in a state-year. "Canals" is the proportion of net area irrigated by government canals in state arable land in a state-year. "Wells" is the proportion of net area irrigated by wells in state arable land in a state-year. "Total roads" is the total road length in a state-year (include National Highways, State Highways, other Public Work Department roads, Zilla Parishad roads, Village Panchayat roads, Panchayat Samiti roads, Urban roads, and Project roads). "Urban roads" is the total urban road length (includes Municipality roads, Military Cantonment roads, Port roads, and Railway Authority roads) in a state-year. "Panchayat Samiti roads" is the length of total Panchayat Samiti roads in a state-year. "Power" is the per capita gross power generated in a state-year.

(ii) All regressions also include the following variables: per capita state domestic product (at constant 1970-71 rupees), the share of agriculture in state domestic product, and proportion of state population characterized as scheduled caste or scheduled tribe. All specifications include state and time dummies.

(iii) The t-ratios, which are heteroskedasticity-robust and corrected for within-state clustering of the error term, are in parentheses; a = significance at the 5 percent level (two-tailed test), and b = significance at the 10 percent level (two-tailed test).

Table 5: Impact of political factors on public goods provision (political competitiveness measure set at one percent)

	Dependent variables						
	Irrigation (1)	Canals (2)	Wells (3)	Total roads (4)	Urban roads (5)	Panchayat Samiti roads (6)	Power (7)
Election year dummy	-0.030[a]	-0.045[a]	0.055[a]	-0.010	0.001	0.021	-0.023
	(2.61)	(2.17)	(1.97)	(0.68)	(0.02)	(0.09)	(1.08)
Effective parties	0.001	0.072	-0.321[a]	-0.141[b]	-0.293[a]	0.606[a]	-0.135[b]
	(0.02)	(0.84)	(2.92)	(1.72)	(2.74)	(1.73)	(1.75)
Political competition	-0.222	-0.777	1.438	1.114[a]	2.014[a]	-3.594	- 0.679
	(0.24)	(0.56)	(0.75)	(1.69)	(2.34)	(1.54)	(0.90)
R-squared	0.94	0.92	0.78	0.94	0.86	0.66	0.96
Number of observations	415	371	368	459	387	136	364

Notes:

(i) "Irrigation" is the proportion of net area irrigated by all sources (government canals, tanks, wells and other sources) in state arable land in a state-year. "Canals" is the proportion of net area irrigated by government canals in state arable land in a state-year. "Wells" is the proportion of net area irrigated by wells in state arable land in a state-year. "Total roads" is the total road length in a state-year (include National Highways, State Highways, other Public Work Department roads, Zilla Parishad roads, Village Panchayat roads, Panchayat Samiti roads, Urban roads, and Project roads). "Urban roads" is the total urban road length (includes Municipality roads, Military Cantonment roads, Port roads, and Railway Authority roads) in a state-year. "Panchayat Samiti roads" is the length of total Panchayat Samiti roads in a state-year. "Power" is the per capita gross power generated in a state-year.

(ii) All regressions also include the following variables: per capita state domestic product (at constant 1970-71 rupees), the share of agriculture in state domestic product, and proportion of state population characterized as scheduled caste or scheduled tribe. All specifications include state and time dummies.

(iii) The t-ratios, which are heteroskedasticity-robust and corrected for within-state clustering of the error term, are in parentheses; a = significance at the 5 percent level (two-tailed test), and b = significance at the 10 percent level (two-tailed test).

Table 6: Impact of political factors on public goods provision (political competitiveness measure set at two percent)

	Dependent variables						
	Irrigation (1)	Canals (2)	Wells (3)	Total roads (4)	Urban roads (5)	Panchayat Samiti roads (6)	Power (7)
Election year dummy	-0.030[a]	-0.047[a]	0.064[a]	-0.007	0.006	0.007	-0.024
	(2.33)	(1.98)	(2.47)	(0.47)	(0.13)	(0.03)	(1.09)
Effective parties	-0.003	0.061	-0.358[a]	-0.146[b]	-0.295[a]	0.675[b]	-0.139[b]
	(0.05)	(0.65)	(3.24)	(1.70)	(2.71)	(1.86)	(1.72)
Political competition	-0.004	-0.067	2.212[a]	0.816[b]	1.178[a]	-3.147[a]	- 0.226
	(0.01)	(0.07)	(2.05)	(1.91)	(1.99)	(2.16)	(0.36)
R-squared	0.94	0.92	0.78	0.94	0.86	0.66	0.96
Number of observations	415	371	368	459	387	136	364

Notes:

(i) "Irrigation" is the proportion of net area irrigated by all sources (government canals, tanks, wells and other sources) in state arable land in a state-year. "Canals" is the proportion of net area irrigated by government canals in state arable land in a state-year. "Wells" is the proportion of net area irrigated by wells in state arable land in a state-year. "Total roads" is the total road length in a state-year (include National Highways, State Highways, other Public Work Department roads, Zilla Parishad roads, Village Panchayat roads, Panchayat Samiti roads, Urban roads, and Project roads). "Urban roads" is the total urban road length (includes Municipality roads, Military Cantonment roads, Port roads, and Railway Authority roads) in a state-year. "Panchayat Samiti roads" is the length of total Panchayat Samiti roads in a state-year. "Power" is the per capita gross power generated in a state-year.

(ii) All regressions also include the following variables: per capita state domestic product (at constant 1970-71 rupees), the share of agriculture in state domestic product, and proportion of state population characterized as scheduled caste or scheduled tribe. All specifications include state and time dummies.

(iii) The t-ratios, which are heteroskedasticity-robust and corrected for within-state clustering of the error term, are in parentheses; a = significance at the 5 percent level (two-tailed test), and b = significance at the 10 percent level (two-tailed test).

Table 7: Impact of political factors on public goods provision (political competitiveness measure set at five percent)

	Dependent variables						
	Irrigation (1)	Canals (2)	Wells (3)	Total roads (4)	Urban roads (5)	Panchayat Samiti roads (6)	Power (7)
Election year dummy	-0.030[a]	-0.046[a]	0.056[a]	-0.009	0.003	0.032	-0.024
	(2.60)	(2.15)	(2.04)	(0.62)	(0.06)	(0.13)	(1.13)
Effective parties	-0.003	0.061	-0.389[a]	-0.156[b]	-0.308[a]	0.599[b]	-0.134
	(0.06)	(0.63)	(3.32)	(1.79)	(2.85)	(1.79)	(1.54)
Political competition	0.003	-0.035	1.210[a]	0.455[a]	0.622[a]	-0.775	- 0.155
	(0.01)	(0.07)	(2.55)	(2.74)	(2.30)	(0.79)	(0.51)
R-squared	0.94	0.92	0.78	0.94	0.86	0.66	0.96
Number of observations	415	371	368	459	387	136	364

Notes:

(i) "Irrigation" is the proportion of net area irrigated by all sources (government canals, tanks, wells and other sources) in state arable land in a state-year. "Canals" is the proportion of net area irrigated by government canals in state arable land in a state-year. "Wells" is the proportion of net area irrigated by wells in state arable land in a state-year. "Total roads" is the total road length in a state-year (include National Highways, State Highways, other Public Work Department roads, Zilla Parishad roads, Village Panchayat roads, Panchayat Samiti roads, Urban roads, and Project roads). "Urban roads" is the total urban road length (includes Municipality roads, Military Cantonment roads, Port roads, and Railway Authority roads) in a state-year. "Panchayat Samiti roads" is the length of total Panchayat Samiti roads in a state-year. "Power" is the per capita gross power generated in a state-year.

(ii) All regressions also include the following variables: per capita state domestic product (at constant 1970-71 rupees), the share of agriculture in state domestic product, and proportion of state population characterized as scheduled caste or scheduled tribe. All specifications include state and time dummies.

(iii) The t-ratios, which are heteroskedasticity-robust and corrected for within-state clustering of the error term, are in parentheses; a = significance at the 5 percent level (two-tailed test), and b = significance at the 10 percent level (two-tailed test).

Table 8: Impact of political factors on public goods provision*

	Dependent variables						
	Irrigation (1)	Canals (2)	Wells (3)	Total roads (4)	Urban roads (5)	Panchayat Samiti roads (6)	Power (7)
Election year dummy	-0.035[a]	-0.021	-0.128	0.002	0.004	-0.295	0.001
	(2.02)	(0.94)	(0.99)	(0.14)	(0.09)	(1.36)	(0.12)
Effective parties	0.000	0.067	-0.363[a]	-0.150[b]	-0.313[a]	0.808[a]	-0.142[b]
	(0.00)	(0.72)	(3.24)	(1.74)	(2.79)	(2.14)	(1.68)
Political competition	-0.028	-0.111	1.411[b]	0.606[b]	1.047[a]	-2.686[a]	-0.058
	(0.06)	(0.16)	(1.73)	(1.94)	(2.06)	(2.76)	(0.12)
R-squared	0.94	0.92	0.78	0.94	0.86	0.67	0.96
Number of observations	415	371	368	459	387	136	364

Notes:

(i) * $Elec_{st}$ equals one, if an election (scheduled or mid-term) takes place in state s during the second half of financial year t or during the first half of the next financial year.

(ii) "Irrigation" is the proportion of net area irrigated by all sources (government canals, tanks, wells and other sources) in state arable land in a state-year. "Canals" is the proportion of net area irrigated by government canals in state arable land in a state-year. "Wells" is the proportion of net area irrigated by wells in state arable land in a state-year. "Total roads" is the total road length in a state-year (include National Highways, State Highways, other Public Work Department roads, Zilla Parishad roads, Village Panchayat roads, Panchayat Samiti roads, Urban roads, and Project roads). "Urban roads" is the total urban road length (includes Municipality roads, Military Cantonment roads, Port roads, and Railway Authority roads) in a state-year. "Panchayat Samiti roads" is the length of total Panchayat Samiti roads in a state-year. "Power" is the per capita gross power generated in a state-year.

(iii) All regressions also include the following variables: per capita state domestic product (at constant 1970-71 rupees), the share of agriculture in state domestic product, and proportion of state population characterized as scheduled caste or scheduled tribe. All specifications include state and time dummies.

(iv) The t-ratios, which are heteroskedasticity-robust and corrected for within-state clustering of the error term, are in parentheses; a = significance at the 5 percent level (two-tailed test), and b = significance at the 10 percent level (two-tailed test).