Politics Off the Grid: Political Competition, Regulatory Control, and Allocation of Natural Resources*

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Abstract

How does political competition shape legislative influence over regulatory decision making? This study shows that in a democracy with pervasive patronage politics, political competition can undermine the strengthening of regulations due to heightened incentives to influence regulators. We propose a probabilistic voting model in which politicians compete for parliamentary seats by promising greater access to a scarce, centrally regulated resource. We show that when regulation is strengthened, the allocative distortion resulting from political competition is larger in constituencies (1) with closely contested elections, (2) where the resource has higher marginal benefit for voters, (3) and where costs of resource extraction are lower. We empirically test these predictions by examining groundwater extraction and the allocation of electricity needed to power irrigation pumps in India, the world's largest democracy. Using nationally representative groundwater and "night lights" data, we find strong evidence for our theoretical predictions.

Key Words: Political Control of Regulation; Groundwater ; Indian Electricity Reforms

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*We wish to thank the Central Groundwater Board of India for providing the groundwater data. We thank Sonal Pandya and Craig Volden for their many valuable insights and suggestions. This paper has benefited from comments by Ken Chay, Pedro Dal Bo, Andrew Foster, Richard Hornbeck, Dan Keniston, Brian Knight, Mushfiq Mobarak, Ariell Reshef, Frank Wolak, and seminar participants at Boston University, Brown, Dartmouth, George Washington University, Kennedy School of Government, SAIS Johns Hopkins, SITE-Governance and Development Session, SITE-Environment Session, University of Michigan - Ann Arbor, UVA, and Yale. Sisir Debnath provided excellent research assistance. Sekhri thankfully acknowledges funding from the International Growth Centre, London School of Economics (Grant # RA-2009-11-029).

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1 Introduction

On July 31, 2012, India experienced an electricity blackout of unprecedented magnitude. For up to two days, 620 million people – half of India's population and nine percent of the world's total population – were without electricity. Excessive power usage in three states was blamed for the grid's collapse. Surendra Rao, former head of India's Central Electricity Regulatory Commission (CERC), commented:

> "[The] blackout was the result of powerful states guzzling more than their budgeted share of electricity while regulators looked the other way...The Load Dispatch Center [personnel] must have known on their screens who was consuming too much. They could have disconnected the customer, they could have disconnected the whole state and protect the grid. They didn't do it. Why doesn't he do it? Because his bosses told him not to do it. Who is his boss? The politician and the bureaucrat [transmission grid regulators]. This is all politics. Everything here is political." ("All Things Considered", National Public Radio)

During CERC's subsequent investigation, the spokesperson for one state's grid regulator showed text messages from politicians coaxing the regulator to maintain an uninterrupted supply of electricity for their constituencies (Indian Express, August 15, 2012).

This example vividly illustrates how legislators' incentives and abilities to control bureaucracies are an essential feature of governance. Three prominent sets of theories examine how legislative and bureaucratic decision-making translate into policy outcomes. Seminal public choice capture theories advance the claim that re-election minded politicians promote the interests of pressure groups by inducing regulatory favoritism, which may result in desirable regulatory outcomes for narrow groups at the cost of the broader public interest (Stigler, 1971; Peltzman, 1976; Becker, 1983).[1] These models do not explicitly distinguish between legislators and bureaucrats.

A second set of theories fills this gap by treating the legislator-bureaucrat relationship as a principal-agent problem. These models, which implicitly assume that legislative control of bureaucracies safeguards voters' interests vis-à-vis unelected bureaucrats, focus

[1] Interest groups have been shown to make campaign contributions to signal their willingness to fight regulatory decisions, and/or influence the appointment of regulators (Grossman and Helpman, 1996; Gordon and Hafer, 2005; Gordon and Hafer, 2007; Besley and Coate, 2003).

attention on assessing the variety of forms that legislative control can take. (Weingast and Moran, 1983 ; McCubbins, Noll, and Weingast, 1987 and 1989; Laffont and Tirole, 1991).[2] However, politicians' own electoral interests can lead to policy choices that are not consonant with economically efficient outcomes (Besley and Coate, 1998; Robinson, et al., 2006).

This points to a potentially important role for unelected bureaucrats. A third theory – the administrative process theory– conjectures that bureaucrats use discretion to regulate in the broad public interest and their actions can result in socially optimal decisions (Crowley, 2008).[3] According to an estimate of the United States Office of Information and Regulatory Affairs (Office of Management and Budget), between 1992 and 2002 the benefits from 107 regulatory rules by far outweigh the costs.[4] Even taken at face value, however, these numbers do not indicate the distribution of benefits and costs across constituents and do not show if an optimal allocation of the benefits across constituencies occurred.

We advance this literature and make three main contributions. First, we model an under-examined mechanism – political competition among candidates – to understand whether strengthening regulatory agencies curbs patronage-based distortions or instead exacerbates them by encouraging rent-seeking politicians to influence the regulators. We propose a probabilistic voting model in which politicians with varying degree of influence over a regulator compete for parliamentary constituencies by promising greater access to a scarce resource that is regulated centrally. We establish that more intense electoral competition prompts legislators to persuade regulators to allocate resources to suit their political goals. Our model integrates insights from all three theories above.

[2]These studies have documented that legislators can exercise oversight (Calvert, Moran, and Weingast 1989), design administrative procedures (McCubbins, Noll, and Weingast, 1987 and 1989; Laffont and Tirole, 1991), or selectively delegate authority (Volden 2002; Huber and McCarty 2004; Gailmard and Patty 2013) in order to align bureaucrats' incentives with their own to safeguard the broad public interest.

[3]Some specific examples from the United States that are consistent with this view include the Environmental Protection Agency's mandates tightening ozone and particulate matter emissions, the Food and Drug Administration's regulation of cigarettes, and the Federal Trade Commission's "Do Not Call" registry preventing telemarketing.

[4]The benefits are estimated in the range of 146.8 to 230.8 billion dollars and the cost in the range of 36.6 to 42.8 billion dollars.

Like the existing theories of regulatory capture, politicians in our framework are re-election minded. But unlike these theories, our posited framework features the role of political competition in regulatory capture. As in agency theories, we explicitly model the interaction between the legislator and the regulator and like the administrative process theory, the regulator in our framework is empowered to make discretionary choices.

Our second contribution is an illustration of spatial inefficiencies emerging from this interaction where some voters benefit at the expense of others, contradicting the notion that either legislative control of bureaucracies or bureaucratic discretion yields outcomes that are in the broad public interest. Specifically, our model predicts that the resulting distortions in resource allocation are greater in constituencies (1) where there is a close contest between candidates, (2) where the resource has higher marginal benefit for voters, (3) where costs of resource extraction are relatively low to begin with. Using the setting of India's power transmission grid regulation, we demonstrate empirically the existence of such inefficiencies.

As a third contribution, we present rigorous, novel evidence establishing that, in a setting with pervasive clientelistic politics, political competition can undermine the strengthening of regulations due to heightened incentives to influence the regulators. An enduring challenge in empirically analyzing the consequences of legislative influence on regulation, and economic consequences thereof, is the lack of micro-data linking elections outcomes to allocations of goods and services valued by voters. We circumvent this challenge by constructing a rich, nationally representative data set from India on election outcomes, groundwater depletion, and electricity allocation (as measured by night-time lights observed by satellites). We then quantify the distortions resulting from a regulatory reform and test our three theoretical predictions above.

Examining groundwater and electricity in India provides a natural, important setting in which to test our theoretical model. Groundwater is vital to the livelihood of Indian farmers and consequently who they vote for. Almost 60 percent of Indian agriculture, which employs more than half of India's work force, is sustained by groundwater irrigation (Sekhri, 2012) and groundwater access impacts poverty (Sekhri, 2014). Electricity is a crucial input for energizing the irrigation pumps: among the 19 million wells used to extract water in India, 15 million wells are energized with electricity as of 2007 (Central Electricity Authority, 2007). Clientelistic exchange between politicians and voters is rampant throughout Indian politics (Chandra, 2004; Wilkinson, 2006), and electricity and groundwater are tangible resources that can be delivered to voters. Min (2010) shows that politicians get electricity diverted and influence uninterrupted supply. Finally, the Indian setting lends us empirical variation to test our theory. The Indian Electricity Act of 2003 provided transmission grid regulators (Load Dispatch Centers) with unprecedented authority over electricity allocations. Using the temporal variation in regulatory authority provided by this reform, we are able to test the predictions of our model. Methodologically, this setting also gives us enough statistical power to use state-of-the-art regression discontinuity analysis to carry out our empirical tests.[5]

We present our evidence by exploring the competition between national and regional party affiliated politicians for seats in the Lok Sabha, India's national parliament. National parties contest elections throughout India, while regional parties contest elections in four or fewer states (typically only one state). Differences in the (i) incentives due to career concerns, (ii) capabilities due to a wider political network, (iii) ideological appeal arising from ethnic affiliation, and (iv) discount rates due to commitment to a region lend a compelling framework to compare regional and national candidates.[6] In the theory section, we highlight evidence that national party politicians have higher incentives and capabilities to influence the regulator and that this core difference plays a vital role. We incorporate ideological appeal in the competition between the candidates. In the alternate hypothesis section in the appendix, we show that a differential in discount rates cannot be a driving force generating our results.

The economic consequences of regulatory empowerment and political competition in our setting are striking. Using nationally representative groundwater data from 1996 to 2006, we motivate our analysis with Figure 1. This figure plots year-by-year average depth to groundwater (proxy for extraction) for parliamentary constituencies won by can-

[5]For example, Bhavnani (2009) discusses the need for large samples to carry out a regression discontinuity analysis.

[6]Unlike surface water, lateral velocity of groundwater underneath the earth's surface is low (Todd, 1980). Hence, spatial externalities over the short- to medium-run are localized, and not very salient or economically significant across constituencies (Sekhri, 2014).

didates of national and regional parties. Prior to the 2003 electricity reform, we observe that depth to groundwater is trending in a similar fashion in the national and regional constituencies. However, a large wedge emerges between the two sets of constituencies in 2004, with declining extraction in regional constituencies relative to national ones. A standard difference-in-differences (DID) regression specification demonstrates that the pre/post changes observed in the figure are statistically significantly different from zero.

Our empirical analysis builds upon this basic result to test the implications of our theoretical model. The first implication is that the reform induces an allocative distortion between constituencies with a national member of parliament (MP) and constituencies with a regional MP, and this distortion is higher when comparing closely contested constituencies, as opposed to less competitive constituencies. To examine close elections, we use a regression discontinuity (RD) strategy in which we compare groundwater depth in constituencies that national candidates narrowly won with depth in constituencies that they narrowly lost. On average, national and regional MPs in these close elections have statistically indistinguishable groundwater depths prior to the reform; however, a sizeable gap emerges immediately after the reform. To examine less competitive elections, we use a DID strategy to compare groundwater depth in constituencies that stayed national ("national regimes") with those that stayed regional ("regional regimes") both before and after the reform. We find that groundwater depth falls less post-reform in national regimes. However, the size of the effect is smaller than in the intensely competitive elections, as our model predicts. In accordance with the second and third implications of the model, we show that the emergent wedge between groundwater depth in national and regional constituencies after the reform is larger in areas where groundwater is valued more, and is larger in areas where delivering a unit of water is less costly for the candidates.

We also find evidence in favor of key assumptions underlying the model. Using constituency-level data, we show strong evidence that electricity allocation (as measured by "average luminosity" or "night lights") varies commensurately with groundwater depth across constituencies. We use survey data on voting patterns to show that voters who cultivate land – and are therefore the most significant interest group benefiting from irrigation – vote more often for national party candidates. In the Appendix, we also show evidence that our findings are difficult to capture with alternative explanations. Among other explanations, we rule out alternative hypotheses involving spatial differences in water demand, differences in voter preferences and democratic responsiveness, differences in the inter-temporal discounting by politicians from different parties, pre-reform distortions in resource allocations, and party affiliation of MPs relative to the party in control in the state or national legislature.

Our work makes salient extensions in two other strands of literature. We complement the recent literature examining the political economy of environmental goods and natural resource provision. Research has shown that career concerns among politicians are pivotal in influencing environmental policy choices (Jia, 2012; List and Sturm, 2006) and political incentives can affect electricity provision and pricing (Min, 2010; Brown and Mobarak, 2009). By contrast, we study the economic and environmental consequences of strengthening regulation that is susceptible to political control. Finally, we further the understanding of economic consequences of political competition. One school of thought documents the adverse effects of political competition on economic outcomes (Lizzeri and Persico, 2005 ; Polo, 1998; Svensson, 1998). On the other hand, a long-standing view is that political competition can have positive economic consequences (Besley et al., 2010; Stigler, 1972; Wittman, 1995). None of these previous studies explore the implications of political competition in relation to regulatory control.

In the next section, we provide background on elections in India, MPs' influence over groundwater extraction and electricity diversion, and the Electricity Act of 2003. In the following section, we develop a theoretical model and derive empirically testable implications. Next, we discuss the data used in the analysis and our empirical strategies, present the empirical tests of our theoretical predictions, and also provide additional evidence on the underlying mechanisms. Following that, we briefly discuss the implications of our results for optimal allocation of resources, and lastly, we provide concluding remarks.

2 Background

2.1 Parliamentary Elections and Influence of MPs on Groundwater Extraction

In the period between 1996 and 2004, four general elections took place for the national parliament.[7] In 1999, a national party (Bharatiya Janata Party (BJP)) and its coalition partners formed the central government. The electoral turnout was 60 percent, which was comparable to previous elections. National parties won 369 seats and regional parties won 162, implying that regional parties won about 30% of the seats. In the 2004 elections, the winning coalition was headed by another national party, the Indian National Congress (INC). The voter turnout was around 60 percent in these elections as well, and regional parties won a comparable 31 percent of the seats.

MPs do not have formal authority over groundwater provision to the farm sector, but they can facilitate access in a number of ways. The most important way is by influencing electricity provision to farmers.[8] In many regions of the country, electricity provision for the agricultural sector is supplied for free or is flatly tariffed based on the horse power of the pump used for water extraction (Shah et al., 2004). However, India suffers from chronic power shortages and power outages are common. This puts a premium on electricity availability, and MPs can easily influence regularity (duration and frequency of power cuts) and timeliness of electricity supply. The timing of power availability is especially crucial because the storage of water is prohibitively costly.[9]

Recent research has highlighted the link between politics and electricity provision in India. Golden and Min (2014) use data from one state to show that electricity losses

[7]We focus on representation in the national parliament, rather than on state legislative assemblies, for several reasons. Electricity is a joint responsibility of the central and state governments, as it appears in the concurrent list of items in the Constitution. Moreover, the Electricity Act of 2003 was a national-level initiative. Because the grid is interconnected and states have an entitlement to central government-owned generation facilities, the reform involved the coordination of regulators at the state and central level.

[8]Politicians can also help farmers invest in wells by providing access to loans. Cole (2009) shows that agricultural loans from Indian public banks follow electoral cycles, illustrating that agricultural voters play an important role in Indian elections.

[9]In the Ancillary Evidence and Robustness Tests Appendix Section C.4, we provide a detailed discussion of the reasons for lack of storage facilities.

increase over the election cycle. Min (2010) presents a case study to show that politicians influence electricity diversion. He documents various instances in which politicians ensure uninterrupted electricity to their constituencies. For instance, politicians routinely request favors from engineers responsible for distributing power locally.

2.2 Power Grid Operations

The within-state operation of the grid entails the collaboration of distribution agencies, transmission agencies, generators, and the State Load Dispatch Centers (SLDCs). Determining the amount of power each distribution point receives is an involved process requiring detailed information sharing between all agencies and the SLDC. The distributors project demand which has to be substantiated with hard evidence. They also have to lay out where the key consumption points are on the grid and how they plan to shed load (scheduled outages are called load shedding). The transmission agency shares information about transmission infrastructure and schedules maintenance or upgrades. Generators convey the generation schedule, though this changes in real time.[10] The SLDC, responsible for overall grid integrity, then works like a clearing house to match demand to rationed supply. Over-drawing power relative to supply can destabilize the grid, resulting in unscheduled power outages. Frequent outages result in severe damage to grid equipment and are therefore expensive.

States are grouped into regions and each group of SLDCs is monitored by the relevant Regional Load Dispatch Center (RLDC). The RLDCs are, in turn, monitored by the National Load Dispatch Center (NLDC). While the RLDCs were in operation throughout our sample period, the NLDC only became operational more recently.

2.3 The Electricity Act, 2003

Given financial problems in the electricity sector, partly due to politically driven misallocation and mis-pricing, reforms have attracted persistent interest. The Electricity

[10] The state is also entitled to the output of national generating facilities in fixed amounts. A formal mechanism since 2002 allows states to buy power off the grid at the Unscheduled Inter-Change rate under the Availability Based Tariff system (Bhanu, 2005). The transactions are not very large, comprising only 3 to 5 percent of energy consumption (Pandey, 2007).

Act of 2003 was passed and put into effect in June 2003. In January 2004, four months before the parliamentary elections in April-May, amendments to the provisions of the Act were implemented.[11]

The Act had the objective of introducing and promoting competition in generation, transmission, and distribution. Importantly, however, by the end of our sample period in 2006, private entry still had not taken off as envisioned by the Act, and competitive wholesale markets were not successfully launched (see Wolak, 2008). Ryan (2013) examines short-term electricity trading sanctioned by the Act, but the day-ahead market he studies did not open until two years after our sample period, in 2008.

In this paper, we instead focus on an immediate consequence of the Act taking place in our sample period: A significant increase in centralized regulation. The SLDCs became responsible for ensuring integrated grid operations (Section 33(1)of the Act). As per Section 33(2), every licensee, generating company, generating station, sub-station, and any other person connected with the operation of the power system had to comply with directions issued by the SLDC, under threat of fines. In turn, the SLDCs had to adhere to the instructions of their respective RLDCs.

Prior to the reforms in 2003, SLDCs had limited monitoring and enforcement capabilities. They resorted to issuing warnings to distribution agents if there was excess load on a line due to over withdrawal. After the reform, the mandated use of software to maintain grid operations significantly enhanced the SLDCs' capabilities. The reforms also introduced greater punitive damages for not complying with SLDC instructions.[12] In the infamous blackout of 2009, three SLDC heads (Punjab, Haryana, and Uttar Pradesh) were fined Rs 100,000 each. The SLDC of Uttarakhand has more recently (in 2013) been charged a fine of Rs 100,000 for overdrawing electricity from the grid and not complying with the provisions of the Electricity Act and the Grid Code (Business Standard, July 2013). Thus, it is clear that fines are being charged as per provisions of the Electricity Act. In the Ancillary Evidence and Robustness Tests Appendix Section C.1 and

[11]The Electricity Act of 2003 was proposed in 2001 and replaced the three existing pieces of electricity legislation: Indian Electricity Act, 1910, the Electricity (Supply) Act, 1948, and the Electricity Regulatory Commissions Act, 1998. The Act can be found at the Ministry of Power's website.

[12]The roles of the SLDC as highlighted by the Power System Operation Corporation Ltd. can be found at: http://srldc.org/Role%20Of%20SLDC.aspx.

Appendix Figure A1, we show further evidence that SLDCs indeed have the power to monitor the grid and allow over-drawing of power.

3 Data Sources

We use three main sources of data in our empirical analysis. The groundwater data are from 16,000 nationally representative monitoring wells monitored by the Central Groundwater Board of India, which maintains the data in a restricted access database. The data provide the spatial co-ordinates of the monitoring wells and groundwater depths for the years 1996-2006.

We matched the groundwater data spatially to the national parliamentary constituencies of India.[13] From the Election Commission of India, we obtain publicly available data from the 1996, 1998, 1999, and 2004 elections on the total votes cast and the elected MP in each constituency, including the MP's party affiliation, gender, caste, and winning margin. The elections data are available in the "*Statistical Report on the General Election to the Lok Sabha*."

According to the Election Commission, a political party is a national party if the commission formally recognizes it in more than 4 states in the country.[14] If it is recognized in four or fewer states, it is considered a regional party. Generally, regional parties contest elections in only one state. Appendix Table A1 provides a list of various parties that contested the 1998, 1999, and 2004 elections, along with their classification as national and regional parties.

Our analysis uses several supplementary data sources for additional robustness tests. We interpolate constituency-level average annual rainfall and temperature values using the University of Delaware 0.5 degree resolution data for India.[15] For household data on electricity usage, we use two waves of the India Human Development Survey conducted by the National Council for Applied Economic Research (NCAER). The first wave –

[13] The constituency boundaries were redrawn in 2008. Hence, we restrict the analysis to elections before 2009.

[14] The criterion for recognition can be found at http://eci.gov.in/eci_main/faq/RegisterationPoliticalParties.asp

[15] Available at http://climate.geog.udel.edu/˜climate/html_pages/archive.html

Human Development Profile of India (HDPI)–was conducted in 1993-1994. The second wave –the India Human Development Survey (IHDS)– was in 2005. A subset of the 1993-1994 districts were revisited in 2005. We use the Food and Agriculture Organization's *Global Agro-ecological Assessment for Agriculture in the 21st Century* spatial raster data to determine suitability indices for water-intensive crops in India. Finally, we use the average luminosity data collected by U.S. Air Force weather satellites. Further details about the crop suitability and average luminosity data appear in the Data and Estimation Procedure Appendix Section A.1.

Table 1 shows the annual mean and standard deviation for depth to groundwater from 1996 to 2006, with each constituency taken as an observation.[16] We see an up-tick in depth over time, indicating aquifers are being depleted. Groundwater depth was 6.4 meters below ground level (mbgl) in 1996 and increased to 7.5 mbgl by 2006. Naturally, this trend masks considerable regional heterogeneity.

4 Theoretical Framework

Our basic framework is a probabilistic voting model. As in seminal work by Lindberg and Weibull (1987) and Coughlin (1991), voters' utility depends on two components: (1) a policy choice for which the candidates observe the welfare gains for voters perfectly; and (2) a stochastic component, such as ideological affinity for a candidate, that candidates cannot perfectly observe, though the probability distribution of this component is common knowledge.[17] We assume there is commitment to campaign promises (Persson and Tabellini, 2002).[18]

We depart from this basic framework in a few ways. First, unlike Lindberg and Weibull (1987) and Coughlin (1991), which examine re-distribution of wealth across a finite number of groups, our policy choice is a public good (electricity) that all voters in a

[16]The number of observations is less than the number of constituencies due to missing groundwater data for some constituencies in some years.

[17]Ethnic identity would be an example of such ideological affinity. Chandra (2004) documents that ethnicity plays a crucial role in Indian politics.

[18]We could endogenously produce commitment using a repeated game which allows voters to punish deviations from campaign promises. While we do not pursue this complexity, in the Appendix Section E.8, we document that MPs rarely switch their constituencies over time.

constituency share access to. Second, rather than maximizing the probability of election, we follow Polo (1998) and Persson and Tabellini (2002 (ch.4)) instead. Specifically, politicians choose a campaign promise of electricity (and hence groundwater) to maximize expected rents – the probability of winning election, multiplied by the rents that the candidate receives conditional on winning.[19] Third, unlike the preceding models where the candidates face the cost of their promises through a government budget constraint, our model has agents other than the politician – the local distributors and the regulator – that shape the costs of campaign promises.

Below, we describe the agents and timing. We then derive testable predictions. The solution of the model, formal assumptions, and proofs are described in the Theory Appendix.

4.1 Model Set-Up

The model consists of four sets of actors: one local distribution agent per constituency; a higher-level regulator; a continuum of voters; and two candidates (one from a national party and one from a regional party). The model has five stages. In Stage 1, the candidates simultaneously promise to secure a certain amount of electricity – and consequently groundwater – for the constituency if they are elected.[20] In Stage 2, voters elect a candidate by majority rule based on the policies to which each candidate has committed. In Stage 3, a party candidate who becomes an elected MP is bound to follow through on chosen policy positions by exerting "influence" on the local distributor and the regulator. In Stage 4, the regulator chooses how lenient to be in the MP's constituency; prior to being empowered by the reform, the regulator does not have a choice, so this stage is most relevant after the reform. In Stage 5, distributors produce the electricity allocations to each constituency, which lead directly to groundwater extraction.

The core assumption in our framework is that national MPs have greater ability

[19] See Lizzeri and Persico, 2001, for an alternative model in which politicians also are driven by the "spoils" of office.

[20] An important assumption that we make is that the politicians are only committing to provide groundwater to the voters. The theoretical implications for other public services are ambiguous but the vital point is that the increase in the water allocation distortion is likely to hold regardless of what happens to the provision of the other service.

and incentives to sway regulators. Existing literature strongly suggests this is the case. India's central government has unilateral powers in many domains that overrule state jurisdiction, and national parties are more likely to be in control of the central government (Parikh and Weingast,1997; Rodden and Rose-Ackerman, 1997). Consequently, national party candidates are likely to have a much wider political network than regional candidates. Since regional parties are typically restricted to one state, their ability to accrue favors is limited outside of their state. In addition, national candidates have stronger career incentives, which are important to politicians (Diermeier et al., 2005). As per independent research in both political science and economics, Bhavnani(2012) and Fisman et al.(2012) use private-asset growth data of Indian politicians in closely contested elections to show that asset growth is strikingly higher (by 13 to 16 percent) for politicians who are in cabinet-level legislative positions (Councils of Ministers (COMs)). The politicians of national parties are much more likely to be elected to the national-level COM in their political lifetime. Almost 30 percent of the members from the governing party are represented in the COM in some capacity. In general, a majority of the COM is from national parties - in the COM that stepped down in May 2014, only 3 out of 33 cabinet officials, 0 out of 12 Ministers of States with Independent Charge, and 3 out of 36 Ministers of State were from regional parties.[21] Thus, the expected returns to office are higher and the cost of influencing regulators is lower for national candidates, compared to regional candidates.

We next describe the objective functions and constraints of each actor in the model.

4.1.1 Distributor

One distributor exists per constituency, and each one chooses how much electricity $\widehat{z_i}$ to supply to constituency i. The distributor takes as given his legal salary S_d and has access to a standard level of electricity a. Units of this electricity allotment can be transferred to other distributors at a unit value p, and additional units of electricity beyond a can be purchased from other distributors at the same unit value p. These

[21]High return to public office is not limited to India. Eggers and Hainmueller (2009) show evidence from Post-war Britain.

purchases, which can happen within a large distribution company or across distribution companies, could be paid for in-kind (through favors or career advancement), rather than in cash. The incentive to obtain electricity for the local constituency comes from the fact that distributors receive a transfer of x_i from the local MP in exchange for a contracted amount of electricity z_i. This transfer is, broadly speaking, "influence," where "influence" can involve monetary payments, in-kind goods, or favors that involve an expenditure of effort on the part of the MP. The distributor only receives x_i if he sets $\widehat{z_i} = z_i$.

However, by drawing more than the standard level of electricity, the distributor exposes himself to the threat of punishment from the regulator. The expected value of the punishment is $q_t(\widehat{z_i} - a)1(\widehat{z_i} > a)$, where $1(.)$ is the indicator function. That is, the expected punishment is increasing linearly in the degree of over-drawing. We index q_t by subscript t, which is 0 prior to the reform and 1 after the reform. Putting the above together, the distributor's optimization problem is therefore:

$$max_{\widehat{z_i}} \qquad S_d + x_i 1(\widehat{z_i} = z_i) - p(\widehat{z_i} - a) - q_t(\widehat{z_i} - a)1(\widehat{z_i} > a) \tag{1}$$

Finally, we assume total electricity capacity available to the state is T. We assume T is a function of p, because electricity can be transferred into or out of the state. We do not model this function. Note that p will be determined endogenously by the choices $\widehat{z_i}$ in each constituency. In equilibrium, $\sum_i \widehat{z_i}(p) = T(p)$ will determine p. In what follows, we will develop comparative statics for the case in which general equilibrium effects of the reform on the price p are smaller in magnitude than a particular level. This is equivalent to assuming that T is highly responsive to p.

4.1.2 Regulator

The state transmission grid is integrated, so that the local distributors are governed by the SLDC, which is monitored by the RLDC. In the model, the regulator is a composite of the SLDC and RLDC; we model the regulator as an institution that can penalize a distributor for drawing more than the prescribed allocation. To do so, the regulator chooses each constituency's q_t, which appears in the distributor's problem above. The regulator makes the choice of q_t to balance two competing objectives: one, following the letter of the law; and two, receiving a gain from an elected MP by deviating from the law.

Prior to the reform, the regulator's monitoring and enforcement ability is low, so the discretion it can exercise is low. For simplicity, we assume that prior to the reform the regulator must set $q_0 = q$ and has no choice. In this case, the regulator's payoff is simply Q_r (a fixed salary).

Post-reform, the regulator has a greater ability to monitor allocations and enforce meaningful punishments. The regulator now has discretion. If the regulator follows the letter of the law, monitoring and enforcement will rise so that $q_1 = q + \epsilon$, where $\epsilon > 0$. In this case, the regulator's payoff is $Q_r + G\epsilon$, where $G\epsilon$ is the career gain from following the law. Alternatively, the regulator can use its improved ability to manage the grid to credibly lower the expected punishment that any given distribution agent will see. In this case, $q_1 = q - \epsilon$ and the regulator receives a payoff of $Q_r + g_i$, where g_i is the amount of influence exerted by the elected MP from constituency i. This could be an illicit financial gain, but more often it could be an improvement in future career prospects through better promotions or in-kind personal favors.[22]

4.1.3 Voters

A continuum of voters exist who differ in their ideology/identity and their value for water. A candidate from party k in constituency i gives voter j the following utility:

$$v_{ijk} = \beta_{ij} w_{ik} + [\delta_{ij}]\, 1(k = R) \tag{2}$$

where the parameter β_{ij} indexes how important water is to voters, and w_{ik} is the water implied by the campaign promise of the candidate from party k in constituency i. Finally,

[22] In our model, voters do not directly try to win over the regulator. This assumption is reasonable for two reasons. One, influencing the regulator directly is costly for voters, whereas voting for a politician who influences the decision-making of the regulator is costless. Two, the MPs could influence the regulator by foiling career progression or doing favors, which may not be possible for voters to accomplish.

δ_{ij} is the ideology/identity of voter j. This ideology/identity indexes the voter's tendency to favor the regional party.

As noted above, voters are heterogeneous: specifically, β_{ij} is distributed uniformly over the interval $[0, 2b]$, and δ_{ij} is distributed uniformly over the interval $[\Delta_i - \psi, \Delta_i + \psi]$, with β_{ij} and δ_{ij} independent of one another. As is standard in probabilistic voting models, we assume Δ_i is stochastic and unknown to the parties in advance of each election. In particular, we assume $\Delta_i = \gamma_i + \nu$, where ν has a standard logistic distribution. Depending on the realization of this parameter, any party may win an election. The constituency-specific mean γ_i is known with certainty by the parties, indexes the expected advantage of the regional party in the constituency on ideological/identity grounds, and can be either positive or negative.

4.1.4 Candidates

Two parties exist, one regional (R) and one national (N), and each party fields a candidate. Prior to the election, the candidate from party k in constituency i chooses a promise of electricity (and hence water) to maximize expected rents:

$$max_{z_{ik}} \quad P_k(z_{ik}, z_{ik'})\left[I_k - \theta_k C(z_{ik})\right] \tag{3}$$

with the constraint that $w_{ik} = A + \frac{z_{ik}}{L}$, where z_{ik} is the amount of electricity promised by the candidate, A is rainfall, and L is the depth to groundwater. Here, I_k is the expected political rent for the candidate, the cost function $C(z_{ik})$ is the minimum influence cost needed to procure the contracted amount z_{ik} from the distributor and regulator, and θ_k gives party k's cost of exerting influence. Finally, $P_k(z_{ik}, z_{ik'})$ is k's probability of winning the election as a function of the electricity promises of party k and the opposing party k'. We assume a large number of constituencies exist, so that any given candidate does not perceive the impact of her electricity promise on p or T from above.

After the election, the elected MP from party k and constituency i must follow through on the promise of z_{ik}. There is no longer uncertainty about being elected. The MP then chooses the level of influence on the distributor (x_i) and the regulator (g_i) to maximize rents. This is equivalent to choosing x_i and g_i to deliver the promised level z_{ik} at the lowest cost.

4.2 Comparative Statics

We use the model to derive testable comparative statics. Our assumptions on parameters, our derivation of the model's solution, and all proofs of the propositions appear in the Theory Appendix. As we discuss in the appendix, constituencies can be divided into low-demand constituencies with low levels of benefits from water (low b) and high-demand constituencies with high levels of benefits (high b). The low-demand constituencies have a Nash equilibrium where the candidates draw less electricity than the standard allocation a, and this equilibrium will not be directly affected by the reform. In contrast, the high-demand constituencies have a Nash equilibrium where the candidates draw more than the standard allocation, and this equilibrium will be directly affected by the reform. In the results below, we focus on the high-demand constituencies, where electricity is most important and responsive to the reform.

We present three propositions and discuss each one to formulate testable hypotheses.

Proposition 1: Assume (A1)-(A2) from the appendix. Then:
(a) $\frac{\partial w_R}{\partial \gamma} < 0$ and $\frac{\partial w_N}{\partial \gamma} > 0$.
(b) There exists γ^* such that constituencies with $\gamma_i > \gamma^*$ have $w_{iN} > w_{iR}$, and constituencies with $\gamma_i < \gamma^*$ have $w_{iR} > w_{iN}$.

Part (a) of the proposition implies that as the regional party's ideological advantage becomes larger (γ_i increases), the regional party candidate will promise less water. This is because the candidate has a greater likelihood of winning on ideology alone, and does not need to exert influence to acquire water. Similarly, as the regional party's ideological advantage becomes smaller, the national party candidate will promise less water. We will test this prediction by empirically examining the relationship between groundwater allocation and margin of victory prior to the reform.

Part (b) does not yield a testable prediction, but we will use this definition of γ^* in

Proposition 3 below. It implies that if the regional party ideological advantage is large enough, then the national party candidate will promise more water than his regional party opponent. Otherwise, the national party candidate can win on ideology, and therefore promises less water than his regional party opponent.

Next, we examine the impact of the reform. If a candidate is able to sway the regulator, $q_1 = q - \epsilon$, whereas if she is not, $q_1 = q + \epsilon$. Prior to the reform, $\epsilon = 0$, so that both national and regional candidates face the same threat of monitoring and enforcement. After the reform, ϵ increases. Under our assumptions on expected political rents and the cost of influence, only the national candidate finds it optimal to influence the regulator.

Proposition 2: Assume (A1)-(A5) from the appendix. Then:
(a) $\frac{\partial(w_{Ni} - w_{Ri})}{\partial\epsilon} > 0$.
(b) $\frac{\partial^2 w_R}{\partial\gamma\partial\epsilon} > 0$ and $\frac{\partial^2 w_N}{\partial\gamma\partial\epsilon} > 0$.
(c) There exists a threshold value γ_h such that $\gamma > \gamma_h$ implies $\frac{\partial w_R}{\partial\epsilon} > 0$, and there exists a threshold value γ_l such that $\gamma < \gamma_l$ implies $\frac{\partial w_N}{\partial\epsilon} < 0$.

Part (a) of Proposition 2 shows the reform will increase the gap in water promises between a national party candidate and a regional party candidate within a constituency, holding all else equal. To empirically test this prediction, we will examine close elections using a "RD" strategy.

Part (b) gives us a prediction for how an "RD" analysis should compare with a "DID" analysis that focuses on national regimes and regional regimes, as defined above. We can think of national regimes and regional regimes as places with a small regional party ideological advantage (low γ) and places with a large regional party ideological advantage (high γ), respectively. Part (b) of Proposition 2 says that as a result of the reform, regional regimes will see electricity promises fall by less, relative to the average regional MP constituency. As a result of the reform, national regimes will see electricity promises increase by less, relative to the average national MP constituency. Therefore, our DID estimates will underestimate the change in $w_{Ni} - w_{Ri}$ within a constituency before and after the reform. The empirically testable prediction is that the DID estimate should be smaller than the RD estimate.

Finally, Part (c) of the proposition shows a surprising result that does not give a testable prediction, but becomes useful in Proposition 3. The reform might actually induce regional candidates to increase their water promises if their ideological advantage is high. If a regional candidate has a large enough chance of winning the election on ideology, the desire to respond to the national candidate's increased promise dominates the direct effect of the reform. A similarly surprising result holds for the national candidates when the regional party ideological advantage is extremely low.

In Proposition 3, we examine the heterogeneous effects of the reform, exploring two dimensions of heterogeneity: the value of water to voters b, and the initial depth of groundwater L. In terms of conducting an empirical test, examining heterogeneity using close elections may run into problems with small sample sizes. Therefore, in the proposition we instead examine how the reform's impacts vary differentially by b and L in low γ and high γ constituencies – national regimes and regional regimes, respectively.

Proposition 3: Assume (A1)-(A5) from the appendix. Then:
(a) $\frac{\partial^2 w_N}{\partial b \partial \epsilon} > 0$ for $\gamma < \gamma^*$ and $\frac{\partial^2 w_R}{\partial b \partial \epsilon} < 0$ for $\gamma > \gamma^*$.
(b) If in addition $\gamma_l < \gamma < \gamma_h$, we have $\frac{\partial^2 w_N}{\partial L \partial \epsilon} < 0$ for $\gamma < \gamma^*$ and $\frac{\partial^2 w_R}{\partial L \partial \epsilon} > 0$ for $\gamma > \gamma^*$.

Part (a) predicts that if national regimes are constituencies with ($\gamma < \gamma^*$) and regional regimes are constituencies with ($\gamma > \gamma^*$), then our DID specifications will show that the post-reform divergence in groundwater depth between national and regional regimes should be larger in magnitude in constituencies where water is highly desirable. Part (b) tells us that in DID specifications with national regimes and regional regimes, the post-reform divergence should be smaller in magnitude if the initial depth to groundwater is higher, as it is more costly to extract from greater depths. The additional restriction in Part (b) means ideology is not so extreme in either direction that the counter-intuitive implications from Proposition 2(c) arise. We will empirically examine these two predictions using data on the suitability of constituencies for a water-intensive crop and groundwater depth in constituencies prior to the reform.

5 Empirical Analysis

Our testable predictions are:

- Groundwater depth is higher in constituencies with more closely contested elections (Proposition 1a)
- The reform increases the gap between national and regional candidate groundwater/electricity promises within a constituency (Proposition 2a)
- The allocative distortion between constituencies with national versus regional MPs is higher when comparing closely contested constituencies, as opposed to less competitive constituencies (Proposition 2b)
- The distortion is larger where the marginal benefit of water to voters is higher
- The distortion is larger where the cost of securing water is lower to begin with.

Here, we test these predictions and present additional evidence on the model's posited mechanisms.

5.1 Competitive Elections Should Be Associated with Higher Groundwater Levels

To examine this prediction, we regress groundwater depth on the absolute value of the winning margin of an MP over the nearest competitor. Higher groundwater depth corresponds to higher groundwater extraction. Therefore, we would expect that the coefficient is negative. The regression yields a highly statistically significant coefficient of -0.02 with a standard error of 0.001.

We can also see this visually in Figure 2, which non-parametrically plots the local means of groundwater depth (and the 95% confidence intervals) for 1996 through 2001. The x-axis shows the winning margin of the regional candidate, with a negative number indicating that the regional candidate lost. The figure shows that groundwater depths tend to be lower in the least competitive elections, particularly for 1999-2001.

5.2 Reform Increases National-Regional Gap

Following the literature, we examine close elections using a regression discontinuity design to test our second prediction.[23] We compare the constituencies where a regional candidate wins by a narrow margin to places where a national candidate wins by a narrow margin. We can estimate the gap between candidates' promises *within* a constituency by comparing realized groundwater depth in a constituency where a national candidate barely won election to the realized depth in a constituency where a regional candidate barely won.

We carry out the RD analysis for every year between 1996 to 2006. Figures 2 and 3 show the results graphically, and Figure 3 is structured analogously to Figure 2. Figure 2 shows local means from 1996 to 2001, and Figure 3 shows local means from 2002 to 2006. In these figures, we discern no difference in depth at the cutoff of 0 from 1996 to 2003 (prior to the reform). But in 2004, we observe a clear difference emerging in the depth to groundwater due to an upward shift in the constituencies with national winners.

We show the magnitudes and standard errors from a non-parametric RD analysis in Table 3. We use a triangular kernel and an optimal bandwidth proposed by Imbens and Kalyanaraman (2012). Column (i) reports the results without covariates, and we include the covariates in column (ii). We see the same pattern in both specifications. The RD estimate is close to 0 before 2004. A sharp change occurs in 2004. In column (i), we observe a shift of 2.6 m, statistically significantly different from zero at 10 percent. In column (ii), the magnitude is similar at 2.75 m, but is more precisely estimated as we control for co-variates. The estimate is now significant at 5 percent. We observe similar but less precisely estimated magnitudes in 2005.

To better understand the size of this estimated effect, we can examine the range of annual groundwater declines in India. The Central Groundwater Board of India issues

[23]Technical details are available in Hahn, Todd, and Van der Klaauw (2001). Applications to political settings can be found in Lee (2008); Eggers and Hainmueller (2009); and Gerber and Hopkins (2011).

annual maps of changes in depth to groundwater. A fairly significant part of the country experienced declines of 2 m or more as per the 2011 report.[24] Hence, a decline in depth of 2.75 m in one year (2004) is plausible. This effect is equivalent to around 0.4 of one standard deviation and is economically significant.

In the Ancillary Evidence and Robustness Tests Appendix Section C.2 and Appendix Figure A2, we show that other controls (including total votes cast) do not exhibit any jump near the winning margin of 0.[25] In the 2002 regression, the optimal bandwidth is 6.7 and it includes 234 constituencies, whereas in 2004 the optimal bandwidth is 6.4 and it includes 171 constituencies. We demonstrate in Appendix Section C.3 and Appendix Figures A3 and A4 that changes in the composition of the constituencies experiencing close elections over time do not drive our close election results.

5.3 Impacts Should Be Smaller When Comparing Less Competitive Constituencies

To examine less competitive elections, we compare the constituencies won by national candidates in both the 1999 and 2004 elections to those won by regional candidates in both elections. Using this sample of national regimes and regional regimes, we estimate a year-by-year DID model for the years 2000 to 2006. This model is specified as:

$$Y_{it} = \alpha_0 + \alpha_1 \, RR_i + \kappa_t + \sum_{l=2001}^{2006} (RR_i . \, d_l) \, \delta_l + \alpha_2 \, X_{it} + \epsilon_{it} \tag{4}$$

where Y_{it} is the depth to groundwater in constituency i and year t, RR_i is an indicator that is equal to 1 if the constituency is a regional regime, vector X_{it} includes time-varying constituency-level controls, and ϵ_{it} is an error term. Finally, d_l are the year indicators, κ_t are year fixed effects, and the coefficients δ_l give the differential year-by-year changes of the regional regimes relative to national regimes. We exclude year 2000 and its interactions as the reference year. We cluster the standard errors at the constituency

[24] These maps are available at http://cgwb.gov.in/documents/Ground%20Water%20Year%20Book%20-%202011-12.pdf

[25] The bias arising from covariate imbalance is discussed in Caughey and Sekhon (2011).

level. In our DID sample, out of a total of 389 constituencies, 295 constituencies had national regimes before and after the 2004 elections and 94 had regional regimes. Table 2 provides summary statistics for the DID sample by constituency regime type.

The results from estimation of (4) are reported in Figure 4 and Appendix Table A2. After the reform, the groundwater depth in regional regimes relative to national regimes is smaller. Many unobserved factors that affect groundwater depth may also affect the probability of a regional regime emerging. Time-invariant unobserved factors will be absorbed in the $R-R$ main effect. Nevertheless, a remaining concern about the validity of this approach could be that the depth to groundwater might evolve differently in the constituencies under national versus regional regimes, and these trends across the reform period drive the results. Therefore, we control for geographical variables such as annual average *Rainfall* and *Temperature*, and other controls including *Area*, *Total votes cast*, and *Gender of the winning candidate* interacted with year indicators. We report the estimates in column (ii) of Table A2. In column (iii), we also control for winning party fixed effects to confirm that the results are not driven by specific party identities.

It could still be the case that unobservables that determine groundwater depth are evolving differentially across national and regional regimes over this time period, violating the identifying assumption. We first explore this possibility by examining the δ_l estimates, which show that there was no statistically significant pre-trend over the 2000-2003 period in the regional regimes, relative to the national regimes. Second, in column (iv) of Table A2, we also control for year-to-year changes in groundwater depth over the pre-years (2000-2003); that is, we include the change in groundwater depth from 2000 to 2001, the change from 2001 to 2002, and the change from 2002 to 2003. Our estimates remain stable, suggesting that pre-period trends are not evolving differently across regime types.

All these specifications indicate that prior to the reforms, the depth to groundwater was similar in both types of regimes. By 2005, depth to groundwater in the regional constituencies is lower than in national ones. The estimates indicate a 1 meter difference in decline of groundwater depth.[26] Importantly, this effect size is less than half of the

[26] In Appendix Section A.2 and Appendix Table A3, we show that results are robust to generalized

effect size in our RD analysis, as Proposition 2B predicts.[27]

5.4 Impacts Should Be Larger Where Water Has Higher Marginal Benefit

To conduct this test, we note that holding all else equal (particularly precipitation), groundwater has a higher marginal benefit to voters in areas that are suitable for growing water-intensive crops. Given that rice is a common water-intensive crop in India, we create an indicator for rice suitability in each constituency, as described in the appendix. We estimate our DID model separately for these categories in Table 4. Panel A reports the results for constituencies with substantial area suitable for growing rice, and Panel B shows the results for constituencies that are largely unsuitable for growing rice.

We find that the results in Panel A are twice as large as those in Panel B. Hence, consistent with our hypothesis, areas that are more suitable for growing a key water-intensive crop experience larger effects after the reforms. We formally test whether the coefficients in Panel A are statistically different than those in Panel B using a fully interacted model. The difference is statistically significant at 11 percent, 6.6 percent, and 11 percent across the three columns, respectively.

5.5 Impacts Should Be Smaller Where Water is More Costly to Extract

To test the final implication of the model, we interact the standard interaction terms from the DID specification with the year 2000 groundwater depth.[28] The results from a fully interacted model are reported in Table 5 using the same four specifications as our

differences-in-differences specifications where we run the DID on a common support of national and regional regimes, as well as match on the basis of pre-reform characteristics before we run the DID.

[27] Our RD estimates are large and significant immediately after the reform is passed and then become imprecise for later years. By contrast, the DID estimates are negative immediately after the reform, but small and imprecisely estimated. The DID estimates become larger over time and become significantly different from zero in 2006. These differences may arise from the fact that these estimation procedures are based on different samples. Unlike the RD specifications, the DID estimates do not include constituencies that switch representation and do not restrict focus to closely contested elections.

[28] At higher depth, more energy is required to extract groundwater. Hence, it is more costly.

overall DID tests.

The main effect is negative and statistically insignificant until 2004. In 2004, it increases three-fold and becomes highly statistically significant at the 1 percent level, remaining negative and significant for 2005 and 2006. The interaction of this main effect with 2000 depth to groundwater is positive, small, and statistically insignificant until 2004. In 2004, this interaction doubles in magnitude to 0.3 and is highly statistically significant at 1 percent and continues to be positive and highly statistically significant in 2005. We can statistically reject the null hypothesis that the triple-interaction coefficient in 2004 and 2005 are the same as for 2002 at 6 percent, 5 percent, and 5 percent, respectively, for the reported specifications. Therefore, the negative effect of the reform is smaller in magnitude where initial groundwater depth is higher, and only in the post-reform years.

5.6 Evidence on Mechanisms - Night Lights

In the model, the key factor that underlies the differences in groundwater depth over time is differential electricity provision by national and regional candidates. If politicians can indeed manipulate electricity provision to their constituencies, then we should expect to see similar patterns for electricity distribution. We use average luminosity (night lights) data as a proxy to examine electricity diversion. Baskaran et al (2014) shows that this is a good proxy for allocation of electricity in India.

We conduct the same non-parametric RD analysis as in Table 3, but now for average luminosity in the constituency. The results are reported in Table 6. Before 2004, the RD estimate is small and positive. It switches sign in 2004, and is negative and statistically significantly different from zero at the 5% level for 2004-2006. These patterns are remarkably consistent with the groundwater depth patterns in Table 3. Although we cannot rule out the possibility of an income effect (increased groundwater availability increases income, which increases demand for electricity), the timing of the electricity response – emerging immediately after the reform – suggests that at least part of this variation reflects electricity diversion as posited by the model.

5.7 Evidence on Mechanisms - Household Survey-Based Electricity Patterns and Voting Behavior

We can examine electricity reliability using two waves of household surveys from the India Human Development survey. The first wave of the survey occurs in 1993-1994 (pre-reform), and the second wave occurs in 2005 (post-reform). Restricting our analysis to a subset of districts that can be matched to constituencies of each regime, we show that the increase in household electrification (i.e., whether a household has any electricity) from 1993/1994 to 2005 has been slower in the regional constituencies. Moreover, and more importantly, the regularity of electricity supply has grown by less in the regional constituencies. The details of this test and discussion of the results are presented in the Additional Evidence on Mechanisms Appendix Section D.1 and Appendix Tables A4 and A5.

Using recent nationally representative voter survey data from after the reform, we also show that cultivators are more likely to vote for national candidates. The details appear in Appendix Section D.2 and Appendix Tables A6 and A7. Therefore, the voters most likely to value groundwater vote more often for national candidates after the reform, which is consistent with our model.

6 Alternate Explanations and Other Robustness Tests

In Appendix Section E, we rule out several alternate explanations. In sub-section E.1, we show that differential demand across regional and national constituencies cannot consistently explain all our findings. In sub-section E.2, we use our findings to argue that the reforms did not reduce pre-existing inefficiencies (such that the areas with regional politicians were using "too much" groundwater prior to the reform). In sub-section E.3, we contend that voter preferences and democratic responsiveness cannot fully explain our findings either. We corroborate that electoral cycles are not drivers of our results using additional tests described in sub-section E.4 and Appendix Table A8. In sub-sections E.5 and E.6, respectively, we discuss whether alignment of the MP with the party forming the state government or the national government matters for our results. The results from the additional tests described there are tabulated in Appendix Tables A9 and A10. We also show that specific party identity among national parties does not matter in sub-section E.7 and Appendix Table A11. Finally, in sub-section E.8 and Appendix Table A12, we show that differing time horizons of national and regional candidates do not drive our results.

7 Does Socially Optimal Allocation Occur Across Constituencies?

We can use our theoretical and empirical results to speak to the issue of whether regulators produced an optimal allocation of electricity and groundwater by providing groundwater to the highest marginal product users.

We find that in close elections after the reform, relatively lower average luminosity and less groundwater extraction occur in jurisdictions that elect regional party MPs. Three explanations are possible for this national-regional gap: (i) National candidates can bring the constituency inputs that are complementary with water and electricity, and the regulator rationally directs greater electricity to national MPs; (ii) regional winners on one side of the cutoff have a large ideology advantage that is balanced by a higher preference for water on the national winner's side of the cutoff; or, as we have stressed, (iii) national MPs enjoy higher expected political rents and/or a lower cost of influence than regional MPs.

If (i) were true, national candidates would always see a higher marginal return to electricity and groundwater than regional candidates. Even before the reform, they would procure more electricity from their distributors than regional MPs. However, in Figure 2 and Table 3, we see that, prior to the reform, no discernible difference exists in water depths.[29]

[29] In addition, we show in Appendix Section E that constituencies whose MP is aligned with the party controlling the national government do not have more groundwater extraction in the year prior to the elections. If they were delivering complementary inputs, we would expect to see a rise in the provision right before elections.

Similarly, Figure 2 suggests (ii) does not hold. If (ii) were true, then voters in closely contested constituencies that yield a national party winner would have a stronger preference for water than the voters in closely contested constituencies that yield a regional party winner. This implies that even prior to the reform, we should see greater groundwater extraction and electricity usage on the national side of the cutoff. But, again, we do not see an economically or statistically significant wedge between regional and national constituencies prior to the reform.

Despite no significant differences in marginal benefits from water and electricity– as suggested by the pre-reform years in Tables 3 and 6 – national candidates are able to facilitate more groundwater extraction than regional candidates post reforms. Therefore, the evidence strongly suggests the Electricity Act of 2003 did not lead to an efficient allocation. In fact, the results indicate that regulatory control ensuing after the reforms actually exacerbated the distortions involved in politically-driven allocations of electricity and water, at least along the national-regional party dimension.[30] This is consistent with the fact that overall extraction rates in India have continued to trend upwards after the reform, indicating that the long-term social cost of depleting aquifers is not being factored into extraction decisions after the reforms.

We can calculate the immediate consequences of this inefficient allocation of electricity in terms of agricultural production using estimates derived by Sekhri (2013). As per these estimates, a one meter decrease in the groundwater depth in a district of India reduces total agricultural production by 7.18 percent on average, and food grain production by approximately 8 percent on average.[31] Using our estimates for the differential impact of the reform in closely contested elections, these numbers would imply an average reduction in total agricultural production and food grain production of 18 percent and 20 percent, respectively, in the constituencies won narrowly by regional candidates. Consequently, regulatory control in the aftermath of the Electricity Act of 2003 had significant economic consequences. [32]

[30]The reforms might have mitigated distortions along other dimensions.

[31]Because districts and parliamentary constituencies do not overlap, we cannot precisely determine the average cost for a constituency.

[32]This decline in agricultural production is a short-term cost. In the long-run, regional constituencies may actually be better off because of the dynamic externalities involved in groundwater extraction.

8 Conclusion

In this paper, we examine a regulatory reform designed to improve the efficacy of an electricity sector fraught with politically driven diversions of electricity. We propose a model of political competition in which politicians compete to win constituencies by facilitating access to electricity on a regulated grid and voters employ electricity to extract groundwater. Our empirical analysis of a rich data set on 16,000 monitoring wells in India confirms key predictions of this model, and our analysis of supplementary data on average luminosity and electricity reliability supports our posited mechanisms. Alternative explanations for our results fail to explain the full set of empirical patterns we present. Consequently, our findings are consistent with distortions introduced by political regulatory control. Our results demonstrate that the reforms created a large and economically consequential distortion in favor of national parties, rather than making allocations independent of politics.

References

[1] Baskaran, T., B. Min, and Y. Uppal(2014), "Election cycles and economic activity: evidence from a quasi-experiment with Indian bye-elections", Unpublished Manuscript

[2] Becker, G. (1983), "A Theory of Competition Among Pressure Groups for Political Influence",*Quarterly Journal of Economics*, Vol. 98, pp. 371-400

[3] Besley, T. and S. Coate (1998), " Sources of Inefficiency in a Representative Democracy: A Dynamic Analysis" *American Economic Review*, Vol. 88 (1), pp. 139-156

[4] Besley, T., T. Persson, and D. Sturm (2010)," Political Competition, Policy and Growth: Theory and Evidence from the United States," *Review of Economic Studies*, Vol.77, pp.1329-1352

[5] Bhanu, B. (2005), " The ABC of ABT: A Primer on Availability Tariff" available at http://nrldc.org/docs/documents/Articles/abc_abt.pdf

[6] Bhavnani, R. (2009), "Do Electoral Quotas Work after They Are Withdrawn? Evidence from a Natural Experiment in India", *American Political Science Review*, Vol. 103(1), pp. 23-35

[7] Bhavnani, R. (2012), "Using Asset Disclosures to Study Politicians Rents: An Application to India", Unpublished Manuscript University of Wisconsin-Madison

[8] Brown, D. and A. Mobarak (2009) ," The Transforming Power of Democracy: Regime Type and the Distribution of Electricity," *American Political Science Review*, Vol. 103(2), pp. 193-213.

[9] Calvert, R. , M. McCubbins, and B. Weingast (1989), "A Theory of Political Control and Agency Discretion" *American Journal of Political Science*, Vol. 33(3), pp. 588-611

[10] Caughey, D. and J. Sekhon (2011), "Elections and the Regression Discontinuity Design: Lessons from Close U.S. House Races, 19422008", *Political Analysis*, Vol. 19, pp. 385-408

[11] Chandra, K. (2004). Why ethnic parties succeed? Patronage and Ethnic Head Counts in India. Cambridge: Cambridge University Press

[12] Cole, S (2009), "Fixing Market Failures or Fixing Elections? Elections, Banks, and Agricultural Lending in India." *American Economic Journals: Applied Economics*, Vol. 1(1), pp. 219-50

[13] Coughlin, P.J. (1991), "Balanced-Budget Redistribution as the Outcome of Political Competition: A Comment", *Public Choice*, Vol. 70(2), pp. 239-243

[14] Crowley, S. (2008). Regulation and Public Interests: The Possibility of Good Regulatory Government. Princeton: Princeton University Press

[15] Diermeier,D., M. Keane, and A. Merlo (2005)" A political economy model of congressional careers", *American Economic Review*, Vol. 95, 347-373

[16] Eggers, A. and J. Hainmueller (2009), " MPs for sale? Returns to office in postwar British politics" *American Political Science Review*, Vol.103, pp. 51333

[17] Fisman, R. Schulz, and V. Vig (2012) ," Private Returns to Public Office", *NBER Working Paper* 18095

[18] Gailmard, S. and J.W. Patty (2013), *Learning While Governing: Expertise and Accountability in the Executive Branch*. The University of Chicago Press, Chicago, United States.

[19] Gerber, E. and D. Hopkins(2011), "When mayors matter: Estimating the impact of mayoral partisanship on city policy", *American Journal of Political Science*, Vol.55, pp. 32639

[20] Golden, M. and B. Min (2014), "Electoral Cycles in Electricity Losses in India", *Energy Policy*, Vol. 65, pp. 619625

[21] Gordon, S. and C. Hafer (2005), "Flexing Muscle: Corporate Political Expenditures as Signals to the Bureaucracy", *American Political Science Review*, Vol. 99(2), pp.245-261

[22] Gordon, S. and C. Hafer(2007), "Corporate Influence and Regulatory Mandate", *Journal of Politics*, Vol. 69(2), pp. 300-319

[23] Government of India (2003), " The Electrcity Act, 2003" enacted into law on 26th May, 2003

[24] Grossman, G. and E. Helpman (1996)," Electoral Competition and Special Interest Politics," *The Review of Economic Studies*,Vol. 63, pp. 265-286

[25] Hahn, J., P. Todd, and W. Van der Klaauw (2001), " Identification and Estimation of Treatment Effects with Regression Discontinuity Design", *Econometrica*, Vol. 69, 201-209

[26] Heckman, J., H. Ichimura and P. Todd (1997), "Matching as an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Program", *Review of Economic Studies*, Vol.64 (4), pp. 605-54

[27] Huber, J. and N. McCarty (2004), "Bureaucratic Capacity, Delegation, and Political Reform", *American Political Science Review*, Vol. 98(3), pp. 481-494.

[28] Imbens, G. and K. Kalyanaraman (2012), " Optimal Bandwidth Choice for the Regression Discontinuity Estimator", *Review of Economic Studies*, Vol. 79 (3), pp. 1021-1052

[29] Jia, R. (2012), " Pollution for Promotion", Unpublished manuscipt, IIES Stockholm University

[30] Jog, S.(July 6, 2013), "CERC penalty on Uttarakhand transmission utility & SLDC," *Business Standard*

[31] Laffont, J. and J. Tirole (1991), "The Politics of Government Decision-Making: A Theory of Regulatory Capture", *Quarterly Journal of Economics*, Vol. 106 (4), pp. 1089-1127.

[32] Lindbeck, A. and J.W. Weibull (1987), "Balanced-budget Redistribution as the Outcome of Political Competition", *Public Choice*, Vol. 52, pp. 273-297.

[33] Lizzeri, A. and N. Persico (2001), "The Provision of Public Goods Under Alternative Electoral Incentives", *American Economic Review*, Vol. 91(1), pp. 225-239

[34] Lizzeri, A. and N. Persico(2005), "A Drawback of Electoral Competition", *Journal of the European Economic Association*, Vol. 3 (6), pp. 13181348

[35] Lee, D.(2008), "Randomized experiments from non-random selection in U.S. House elections", *Journal of Econometrics*, Vol. 142, 67597

[36] List J., and D. Sturm (2005), "How Elections Matter: Theory and Evidence from Environmental Policy", *Quarterly Journal of Economics*, Vol. 121, pp. 1249-81

[37] McCubbins, M. , R. Noll, and B. Weingast(1987),"Administrative Procedures as Instruments of Political Control", *Journal of Law, Economics, and Organization*, Vol.3(2), pp. 243-277

[38] McCubbins, M. , R. Noll, and B. Weingast(1989), "Structure and Process, Politics and Policy: Administrative Arrangements and the Political Control of Agencies", *Virginia Law Review*, Vol. 75, pp. 431-482

[39] Min, B. (2010), "Distributing Power: Public Service Provision to the Poor in India," Unpublished Manuscript University of Michigan

[40] Office of Management and Budget, Office of Information and Regulatory Affairs (2003), " Informing Regulatory Decisions: 2003 Reprt to Congress on the Costs and Benefits of Federal Regulations and Unfunded Mandates on State, Local, and Tribal Entities"

[41] Pandey, V. (2007) , "Electricity Grid Management in India: An Overview", *Electrical India*, Vol. 47 (11)

[42] Parikh, S. and B. Weingast(1997), "A Comparative Theory of Federalism: India", *Virginia Law Review*, Vol. 83(7), *Symposium: The Allocation of Government Authority* (Oct., 1997), pp. 1593-1615

[43] Peltzman, S.(1976),"Toward a More General Theory of Regulation", *Journal of Law and Economics*, Vol. 19, pp. 211-240.

[44] Persson, T. and G. Tabellini (2002), *Political Economics: Explaining Economic Policy*, Zeuthen Lecture Book Series, MIT Press.

[45] Polo, M. (1998), "Electoral Competition and Political Rents", Unpublished Manuscript, IGIER and Bocconi University.

[46] Robinson,J., R. Tornik, and T. Verdier (2006), "Political Foundations of Resource Curse",*Journal of Development Economics*, Vol. 79, pp. 447-468

[47] Rodden, J. and S. Rose-Ackerman (1997), "Does Federlaism Preserve Markets?", Vol. 83(7), *Symposium: The Allocation of Government Authority* (Oct., 1997), pp. 1521-1572

[48] Ryan, N. (2013)," The Competitive E?ects of Transmission Infrastructure in the Indian Electricity Market", Unpublished Manuscript

[49] Sasi, A. (August, 2012),"For recent failures in grids, central power regulator fines state officers", *The Indian express*

[50] Sekhon, J. and Titiunik, R. (2012), "When Natural Experiments are Neither Natural or Experiments", *American Political Science Review*, Vol. 106 (1), pp. 35-57

[51] Sekhri, S. (2013), "Missing Water: Agricultural Stress and Adaptation Strategies in response to Groundwater Depletion among Farmers in India", Working Paper

[52] Sekhri, S. (2012), "Sustaining Groundwater: Role of Policy Reforms in Promoting Conservation in India", *India Policy Forum 2012-13*, Volume 9, Editors Shekhar Shah, Barry Bosworth, and Arvind Panagariya

[53] Sekhri, S. (2014), "Wells, Water,and Welfare: The Impact of Access to Groundwater on Rural Poverty and Conflict", *American Economic Journal: Applied Economics*, Vol. 6(3), pp. 76-102

[54] Stigler, G. (1971)," The Theory of Economic Regulation", '*The Bell Journal of Economics and Management Science*, Vol. 2(1), pp. 3-21

[55] Stigler, G(1972), "Economic Competition and Political Competition", *Public Choice*, Vol. 13 (1),pp. 91106

[56] Svensson, J. (1998), "Controlling Spending: Electoral Competition, Polarization, and Primary Elections" Mimeo, The World Bank

[57] Todd,D. (1980), Groundwater Hydrology, John Wiley and Sons, 2nd ed.

[58] Volden, C. (2002), "A Formal Model of the Politics of Delegation in a Separation of Powers System", *American Journal of Political Science*, Vol. 46(1), pp. 111-133.

[59] Weingast, B. and M. Moran(1983), "Bureaucratic Discretion or Congressional Control? Regulatory Policy Making by the Federal Trade Commission", *Journal of Political Economy*, Vol. 5, pp. 765-800

[60] Wilkinson, S. (2006),"Explaining Changing Patterns of Party Voter Linkages in India", In In *Patrons, Clients or Politics: Patterns of Political Accountability and Competition,* eds. Herbert Kitschelt and Steven I. Wilkinson. New York: Cambridge University Press, pp. 11040

[61] Wittman, D. (1995), *The Myth of Democratic Failure: Why Political Institutions are Efficient*, Chicago: University of Chicago Press

[62] Wolak, F. (2008), " Reforming the Indian Electricity Supply Industry" *Sustaining India's Growth Miracle*, pp. 115

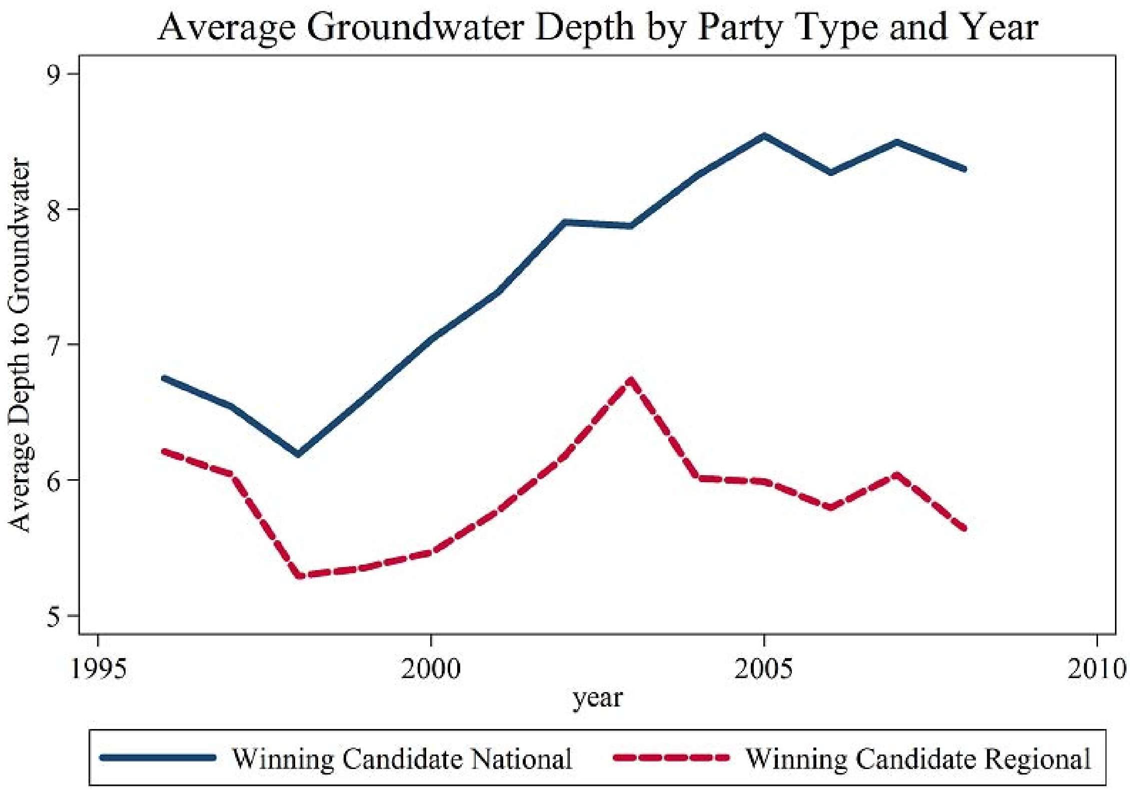
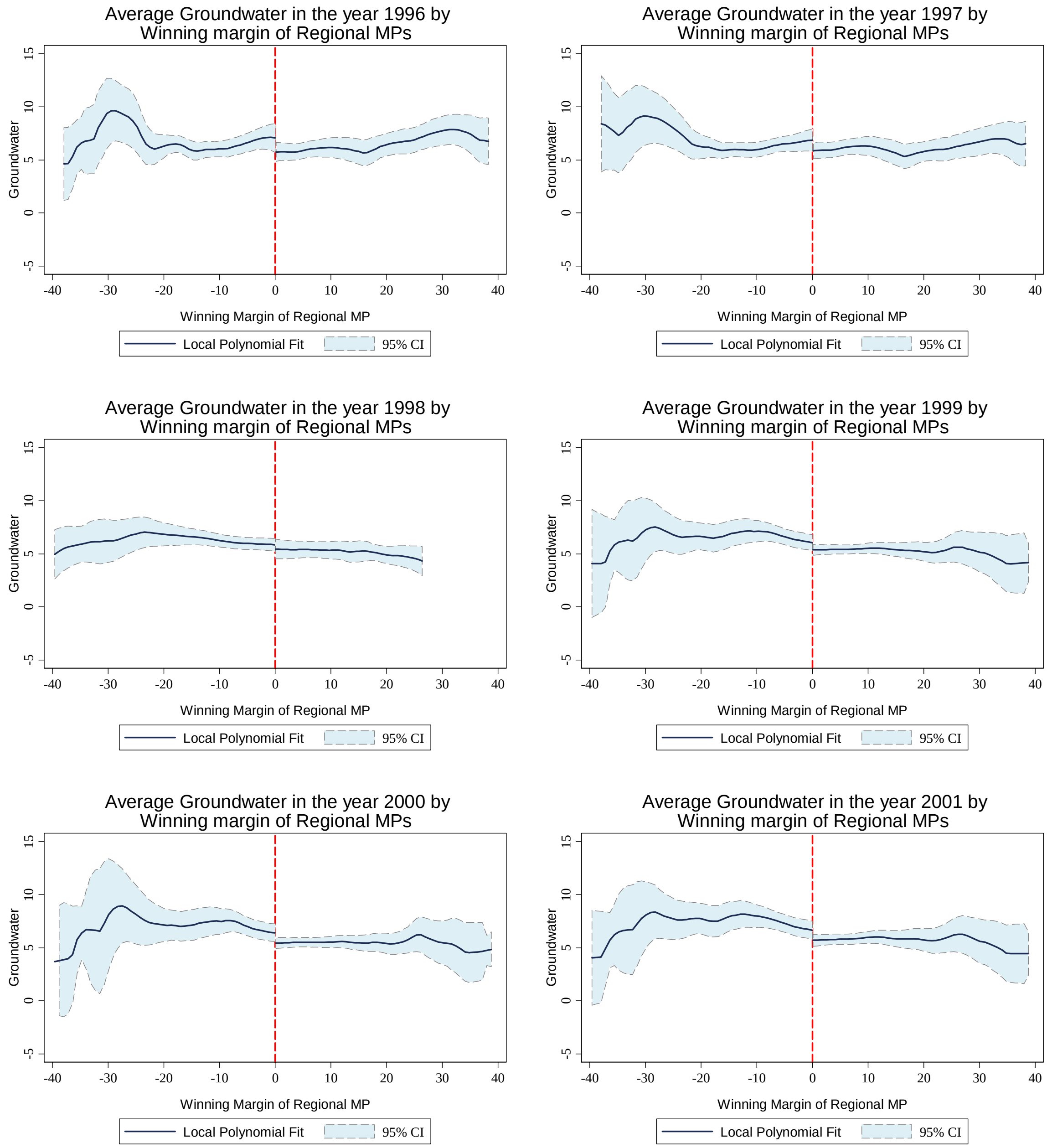


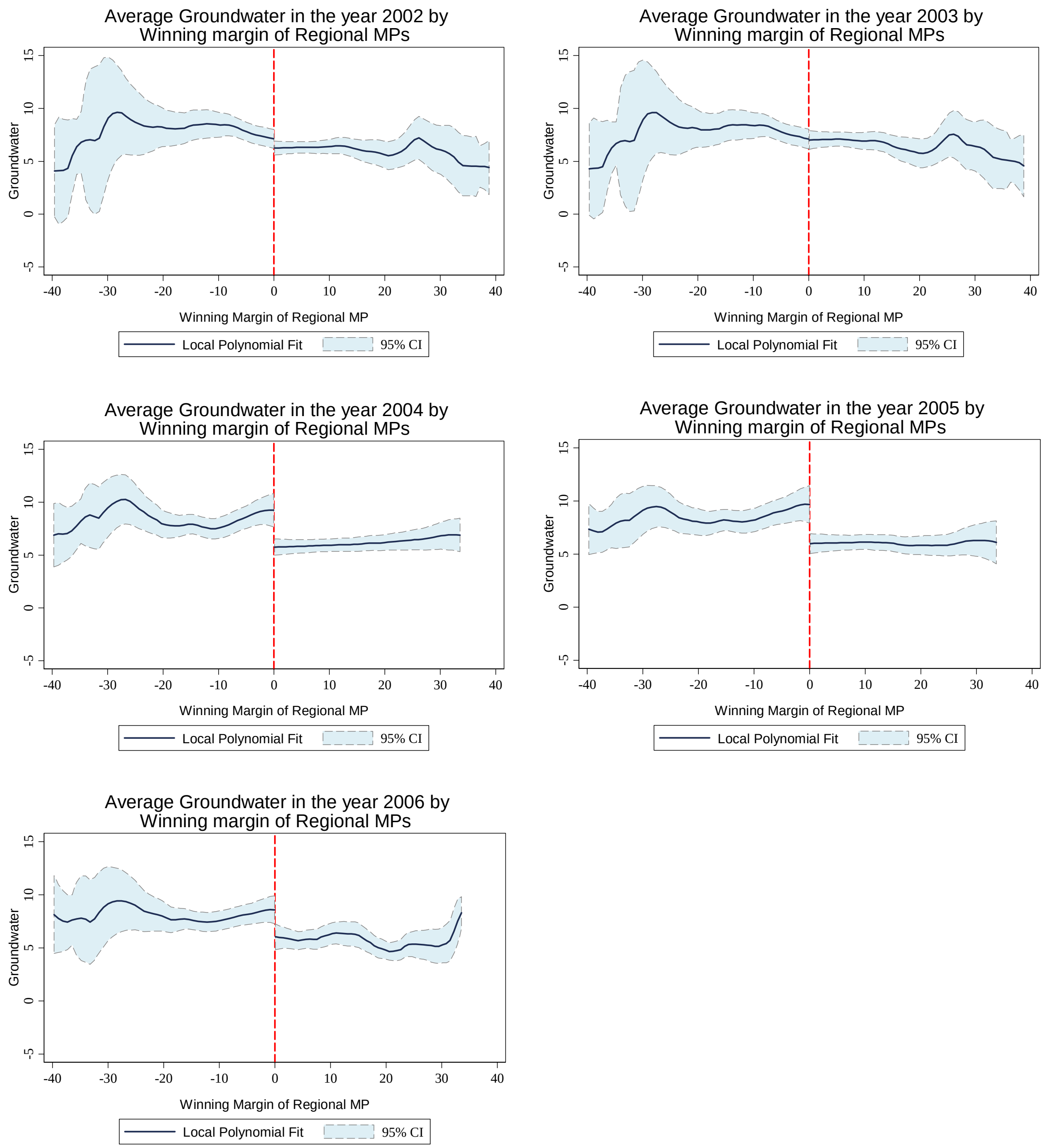
Figure 1: This figure plots the trends in Depth to Groundwater for National and Regional Constituencies

Average Groundwater level by Winning Margin of Regional MP and year



Notes: The data is restricted to constituencies where the winning candidate was affiliated to a National or a Regional party. Winning Margin of a Regional MP is the product of winning margin and a variable equal to -1 if the winning candidate is affiliated to a National party equal to 1 if affiliated to a Regional party.

Figure 2: Regression Discontinuity Comparisons for Years 1996 to 2001



Notes: The data is restricted to constituencies where the winning candidate was affiliated to a National or a Regional party. Winning Margin of a Regional MP is the product of winning margin and a variable equal to -1 if the winning candidate is affiliated to a National party equal to 1 if affiliated to a Regional party.

Figure 3: Regression Discontinuity Comparisons for Years 2002 to 2006

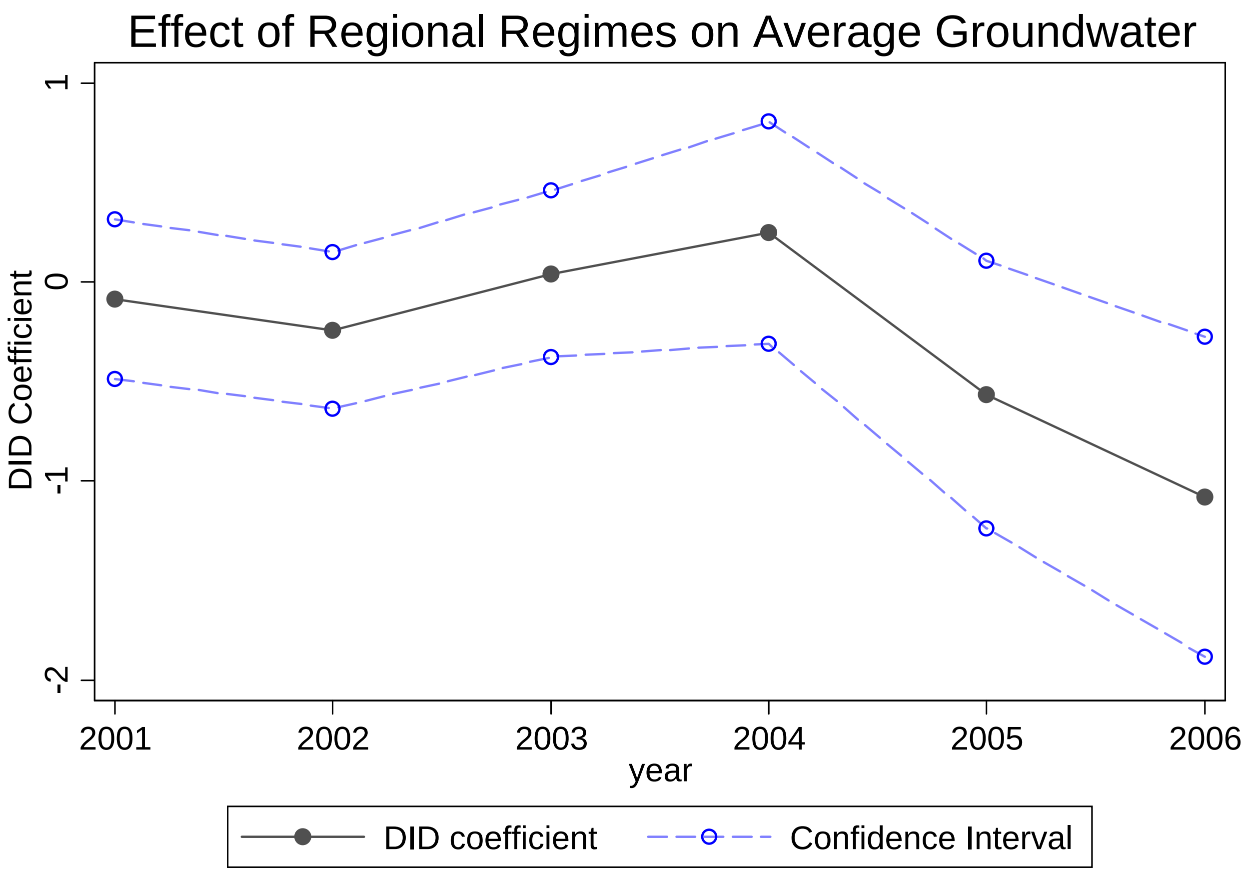


Figure 4: This figure plots the year-by-year estimates of the effect of regional party legislator on groundwater depth relative to year 2000

Table 1: Summary Statistics for Average Depth to Groundwater (in meters)

	Mean	SD	Min	Max	Obs
1996	6.557	5.571	1.188	67.160	519
1997	6.367	4.858	1.584	47.695	519
1998	5.933	4.768	1.401	46.575	520
1999	6.204	4.873	1.322	47.284	518
2000	6.544	5.535	1.360	57.172	517
2001	6.881	5.538	1.474	51.926	519
2002	7.362	5.961	1.288	58.157	519
2003	7.509	6.061	1.430	56.178	518
2004	7.518	5.669	1.290	49.166	518
2005	7.682	6.076	1.400	52.155	477
2006	7.491	6.822	1.228	68.467	523

Table 2: Summary Statistics by Regime Type between 2000 and 2006

Sample	**All Constituencies**			**Constituencies with Regional incumbent and winner in 2004 Elections**			**Constituencies with National incumbent and winner in 2004 Elections**		
No. of Constituencies	**389**			**94**			**295**		
Variable	Mean	S.D.	# Obs	Mean	S.D.	# Obs	Mean	S.D.	# Obs
Depth to Groundwater in 2000	7.11	6.24	2618	5.31	2.16	623	7.67	6.95	1995
Depth to Groundwater in 2006	8.01	7.67	2639	5.74	3.16	623	8.71	8.47	2016
Average Rain	99.98	64.93	2688	101.45	60.08	658	99.50	66.43	2030
Average Temperature	25.67	3.02	2688	25.87	3.75	658	25.60	2.74	2030
Total Votes Cast	694923.20	179004.80	2723	698581.20	171447.50	658	693757.60	181371.70	2065
Area	6245.28	6675.96	2566	4276.98	2708.12	605	6852.53	7382.46	1961
Winning Candidate is Male	0.91	0.28	2723	0.93	0.26	658	0.91	0.29	2065

Note: Data used from 'Lok Sabha' (directly elected lower house of the parliament of India) elections for the years 1999 and 2004. A political party is called a `National' party if it is a recognized by the Election Commision of India in four or more states. If a party is recognized in less than four states it is called a `State' party (regional in our notation). The data is restricted to Parliamentary Constituencies with a National or Regional incumbent and winner in 2004 elections and the years 2000 to 2006.

Table 3 : Non-Parametric Regression Discontinuity Estimates

Depth to Groundwater from the Surface
(in meters below ground level)

	(i)	(ii)	(iii)	(iv)
R-R × Year 2001	-0.412	-0.024	224	6.2
	(0.864)	(0.841)		
R-R × Year 2002	-0.481	-0.051	234	6.7
	(0.9)	(0.824)		
R-R × Year 2003	0.184	0.373	233	6.6
	(1.034)	(0.937)		
R-R × Year 2004	**-2.599***	**-2.75****	171	6.4
	(1.51)	(1.36)		
R-R × Year 2005	**-2.567**	**-2.603***	167	7
	(1.65)	(1.6)		
R-R × Year 2006	-1.358	-1.682	173	6.4
	(1.5)	(1.6)		
Covariates	No	Yes		

Notes: Covariates include total votes, gender of the winning candidate, area of a constituency, and average annual rain and temperature. Triangular Kernel and optimal bandwidth proposed by Imbens and Kalyanaraman (2009) has been used. Column (iii) reports numbers of observations in each regression and column (iv) reports the bandwidth used. *** indicates significance at 1 percent, ** at 5 percent and * at 10 percent level.

Table 4: Impact by Suitability for Cultivating Water Intensive Crops

Dependent variable: Depth to Groundwater from the Surface (in meters below ground level)

	(i)	(ii)	(iii)
Panel A: Constituencies Suitable for Rice Cultivation			
R-R × Year 2001	**0.065**	**0.013**	**0.065**
	(0.44)	(0.46)	(0.44)
R-R × Year 2002	**-0.39**	**-0.47**	**-0.39**
	(0.49)	(0.49)	(0.49)
R-R × Year 2003	**-0.0073**	**-0.028**	**-0.0073**
	(0.44)	(0.45)	(0.44)
R-R × Year 2004	**0.56**	**0.43**	**0.56**
	(0.52)	(0.53)	(0.52)
R-R × Year 2005	**-0.38**	**-0.63**	**-0.38**
	(0.66)	(0.68)	(0.66)
R-R × Year 2006	**-1.89****	**-2.14****	**-1.89****
	(0.82)	(0.86)	(0.82)
Observations	662	662	662
R-Sqaured	0.18	0.25	0.53
Panel B: Constituencies Not Suitable for Rice Cultivation			
R-R × Year 2001	**-0.091**	**-0.071**	**-0.091**
	(0.17)	(0.19)	(0.17)
R-R × Year 2002	**-0.16**	**-0.15**	**-0.16**
	(0.18)	(0.18)	(0.18)
R-R × Year 2003	**0.16**	**0.15**	**0.16**
	(0.22)	(0.23)	(0.22)
R-R × Year 2004	**0.11**	**0.093**	**0.11**
	(0.31)	(0.32)	(0.31)
R-R × Year 2005	**-0.58**	**-0.57***	**-0.58**
	(0.37)	(0.34)	(0.37)
R-R × Year 2006	**-0.49**	**-0.49**	**-0.49**
	(0.40)	(0.35)	(0.40)
Observations	1852	1852	1852
R-Sqaured	0.27	0.30	0.75
Winning party Fixed Effects	No	Yes	No
Change in Water levels in Pre-years	No	No	Yes
Winning Margin	No	Yes	No

Notes: The sample is restricted to years 2000 to 2006. Each regression controls for geographic controls including annual average rain and temperature at the level of constituency; and other controls including total vote cast, gender of the winning candidate and area of the constituency interacted with year indicators. Errors are robust and clustered at the level of Parliamentary constituencies. *** indicates significance at 1 %, ** at 5% and * at 10 %. Panel A shows the results for constituencies where the mode value of the index for suitability for rice cultivation takes values 1-4. Panel B shows results for constituencies where the mode of the index takes value takes values 5-8. The index value 1 indicates most suitable and value 8 denotes least suitable.

Table 5: Impact by Baseline Depth to Groundwater

	(i)	(ii)	(iii)	(iv)
R-R × Year 2001	**-0.91****	-0.55	-0.5	-0.55
	(0.38)	(0.35)	(0.37)	(0.35)
R-R × Year 2002	**-0.94***	-0.62	-0.57	-0.62
	(0.48)	(0.47)	(0.45)	(0.47)
R-R × Year 2003	-0.66	-0.32	-0.26	-0.32
	(0.43)	(0.42)	(0.38)	(0.42)
R-R × Year 2004	**-1.55*****	**-1.45*****	**-1.45*****	**-1.45*****
	(0.57)	(0.56)	(0.53)	(0.56)
R-R × Year 2005	**-2.62*****	**-2.43*****	**-2.36*****	**-2.43*****
	(0.76)	(0.72)	(0.72)	(0.72)
R-R × Year 2006	**-1.14***	**-1.20***	**-1.13***	**-1.20***
	(0.65)	(0.66)	(0.68)	(0.66)
R-R × Year 2001 X Depth 2000	0.15**	0.092	0.081	0.092
	(0.7)	(0.7)	(0.7)	(0.7)
R-R × Year 2002 X Depth 2000	0.14	0.092	0.081	0.092
	(0.9)	(0.9)	(0.9)	(0.9)
R-R × Year 2003 X Depth 2000	0.19**	0.13	0.11	0.13
	(0.9)	(0.9)	(0.8)	(0.9)
R-R × Year 2004 X Depth 2000	**0.32*****	**0.30*****	**0.30*****	**0.30*****
	(0.11)	(0.10)	(0.10)	(0.10)
R-R × Year 2005 X Depth 2000	**0.41*****	**0.4*****	**0.4*****	**0.4*****
	(0.14)	(0.4)	(0.4)	(0.4)
R-R × Year 2006 X Depth 2000	0.17	0.15	0.15	0.15
	(0.14)	(0.14)	(0.14)	(0.14)
Geography & other controls	No	Yes	Yes	Yes
Winning party Fixed Effects	No	No	Yes	No
Change in Water levels in pre-years	No	No	No	Yes
Winning Margin	No	No	Yes	No
Observations	2587	2536	2536	2536

Notes: The sample is restricted to years 2000 to 2006. Geographic controls include annual average rain and temperature at the level of constituency. Other controls include total vote cast, gender of the winning candidate and area of the constituency interacted with year indicators. Errors are robust and clustered at the level of Parliamentary constituencies. *** indicates significance at 1 %, ** at 5% and * at 10 %.

Table 6: Non-Parametric Regression Discontinuity Estimates

	Average Luminosity (Night Lights)	
	(i)	**(ii)**
R × Year 2001	1.402	0.261
	(1.3)	(1.18)
R × Year 2002	1.272	0.242
	(1.18)	(1.06)
R × Year 2003	1.794	0.595
	(1.31)	(1.15)
R × Year 2004	**-2.92****	**-3.07****
	(1.417)	(1.22)
R × Year 2005	**-3.944*****	**-3.695****
	(1.53)	(1.478)
R × Year 2006	**-2.551****	**-3.374****
	(1.326)	(1.436)
Covariates	No	Yes

Notes: Covariates include total votes, gender of the winning candidate, area of a constituency, and average annual rain and temperature. Triangular Kernel and optimal bandwidth proposed by Imbens and Kalyanaraman (2009) has been used. *** denotes significance at 1 percent, ** at 5 percent and * at 10 percent