Voter Rationality and Politician Incentives:
Exploiting Luck in Indian and Pakistani Elections[1]

Job Market Paper

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Abstract

Recent empirical work on US elections argues that the observed relationship between exogenous shocks and electoral outcomes is evidence of voter irrationality. In contrast, I develop a theoretical framework which highlights how politician behavior, in the form of effort and corruption, can respond to exogenous shocks such as rainfall in South Asia. Rain can affect voters' aggregate income and change an opportunistic politician's incentives to steal from them and be corrupt. Alternatively, rainfall can affect production on a politician-landowner's own farm, and therefore change his incentives to put in farm labor versus political effort. The model shows that politicians behave better (in terms of higher effort and lower corruption) with good rainfall when there is an incumbency advantage, and behave worse with good rainfall when there is an incumbency disadvantage. Using data from both Indian and Pakistani parliamentary elections, I show that rainfall is significantly positively related to politician re-election in times of incumbency advantage and negatively related to re-election in times of incumbency disadvantage. These results are consistent with a rational voter response to changes in politician behavior. Evidence using development fund spending and politician occupations suggests that politician behavior works via the effort mechanism.

JEL Classification: D72, O1

1   Introduction

How do voters elect their representatives and hold them accountable? Classical democratic theory states that voters collect information on party platforms, policy pronouncements, legislative voting, etc, on all candidates and cast their vote for the candidate who offers them the best package. However, collecting such information on each candidate is costly, and voters know that policy pronouncements are non-binding. Retrospective voting, on the other hand, places less of an information demand on voters (Key (1966); Fiorina (1981)). However, it poses a principal agent problem: voters want to re-elect competent leaders, but cannot directly observe effort and ability. In voting retrospectively, they respond to economic indicators that reflect an incumbent's performance. In addition, rational retrospective voters should also filter out exogenous factors, such as rainfall, which affect economic outcomes but lie beyond the politician's control. An inability to do so raises the probability of re-electing lucky but incompetent incumbents and results in a lack of political accountability.

A number of recent working papers, notably Wolfers (2007), Achen and Bartels (2004), and Healy (2006), study data from US elections to show that politicians are re-elected in lucky times and voted out in unlucky times. Wolfers relates oil price shocks to US governors' probability of re-election, while Achen and Bartels show that there is an electoral response to droughts and floods in US presidential elections, and Healy uses individual-level voting data to show that weather affects voting behavior through income. All three papers argue that the observed relationship between exogenous shocks and electoral outcomes is evidence of voter irrationality. Two other strands of literature also reach similar conclusions about irrational principals. Bertrand and Mullainathan (2001) show that a CEO's pay responds to exogenous factors that affect his company's industry. Social psychology experiments also show that subjects in experiments aiming to assess competence systematically fail to take sufficient account of background or environmental factors (Durell (2001); Weber et al. (2001)).

This literature relies on the critical assumption that there is no response by politicians, or the agents, to exogenous shocks or "luck". As soon as there is any interaction of an exogenous shock with politician behavior, we can no longer conclude that a relationship between shocks and politician re-election is evidence of voter irrationality. In this paper, I combine theory and empirics to show that the relationship between electoral outcomes and luck in South Asia is consistent with

a rational voter response to changes in politician incentives[2].

I formalize the notion that rational voters respond to politician behavior; that is, voters vote out the politician if he is more corrupt or puts in less effort. Rainfall serves as the exogenous shock which changes politician behavior in an agricultural context. I assume that good politicians always undertake the best action, and therefore rainfall does not change their behavior. However, rain can affect voters' aggregate income and change the opportunistic politician's incentives to steal from them and be corrupt. Alternatively, rainfall can affect production on an opportunistic politician-landowner's own farm, and therefore change his incentives to put in farm labor versus political effort. The corruption and effort mechanisms yield analogous results (described below) for changes in the opportunistic politician's behavior, but the effort model is relatively benign in terms of its effect on constituents' welfare. In my empirical work, I test whether the effort mechanism is consistent with politician behavior in the South Asian context, but cannot directly test for corruption due to lack of data.

The model shows that the effect of exogenous shocks on politician behavior varies with the underlying political environment of incumbency advantage or disadvantage. Incumbency advantage (disadvantage) signifies a high (low) probability of re-election which is independent of behavior, and politicians take it as given. In times of incumbency advantage, better rainfall improves the behavior of opportunistic politicians (in terms of lower corruption and higher effort), and they are therefore more likely to be re-elected. This can be termed the "income" effect of higher rainfall, and it exists in times of incumbency advantage precisely because the politician is more likely to get the benefit from re-election in such times. In times of incumbency disadvantage, however, better rainfall worsens the politician's behavior and lowers his re-election probability. This "substitution" effect of rainfall exists in times of incumbency disadvantage because the politician is less likely to get the benefit from re-election and therefore he substitutes into activities that make money now. In contrast to this theoretical framework, an irrational voter model would predict that politicians are always more likely to be re-elected when there is better rainfall, regardless of the political environment, because voters respond to higher personal income as opposed to politician behavior.

I empirically examine the relationship between electoral outcomes and rainfall using constituency-level data for eight parliamentary elections in India, and four parliamentary elections in Pakistan.

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[2]There was a similar paradigm shift from voter irrationality to rationality in moving from traditional business cycle theories to budget cycle theories. The traditional political business cycle literature argues that voters are systematically fooled by politicians who manipulate monetary policy resulting in temporary output and employment increases before an election. However, Rogoff (1990) shows that politicians who generate political budget cycles through expansionary fiscal policy may use this to signal competence.

My rainfall measure is the proportional deviation of annual rainfall from mean annual rainfall in the constituency, which is positively and monotonically related to crop yield and agricultural productivity in South Asia. Incumbency advantage and disadvantage are measured using regression discontinuity design, as the causal advantage attributed to being an incumbent. I regress re-election on rainfall, controlling for election year and constituency fixed effects. The results show that rainfall is significantly positively related to politician re-election in India pre-1991, when there was an incumbency advantage, and negatively related to re-election post-1991, when there was an incumbency disadvantage. Infact, the shift in the rainfall-re-election relationship exactly mirrors the shift from incumbency advantage to disadvantage in India in 1991. Rainfall is negatively associated with re-election in Pakistan in its democratic period, which was also characterized by an incumbency disadvantage.

The magnitudes of the effect are moderately large across both countries, on the order of a 6% change in the probability of re-election with a one standard deviation change in rainfall relative to mean rainfall. I find that the rainfall effect exists only in rural constituencies, which is logical given that rain increases crop production. Given the shift in the electoral response to rainfall with the underlying political environment, my results are not consistent with an irrational voter model, and suggest a rational voter response to changes in politician behavior.

The incumbency advantage in India pre-1991 is exclusive to members of the Congress Party, and does not exist for non-Congress incumbents. Post-1991, both Congress and non-Congress incumbents suffer an incumbency disadvantage (Linden, 2004). Separating out my main results by party shows that the positive relationship between electoral outcomes and rainfall in India pre-1991 is driven exactly by Congress incumbents, which is logical given that they face the incumbency advantage. Post-1991, there is a negative relationship between electoral outcomes and rainfall for non-Congress incumbents, and the positive relationship is driven down significantly for Congress incumbents, consistent with the fact that both groups now face an incumbency disadvantage.

I show that rainfall on the election day does not have a pure weather effect on voting behavior. I also exploit the fact that the parliament was dissolved prematurely in Pakistan in each of the four election terms under study as a falsification test. Since politician behavior does not exist and cannot change during the time in which the parliament is dissolved, electoral outcomes should not be related to rainfall during this duration under the assumption of voter rationality. My results cannot reject the null hypothesis of rational voter behavior.

I provide some evidence that the relationship between rainfall and re-election works via politi-

cian effort, using data on Pakistani legislators' development fund spending and Indian legislators' occupations. First, the presumption behind the effort mechanism is that politicians are part-time agriculturists, who must divide their time between their farm and the political arena. Using data on Indian politicians' occupations, I find that the rainfall effect exists exactly for those politicians whose only other occupation is being an agriculturist, and not for other politicians. This evidence is suggestive of effort as the mechanism behind the main results. Second, Pakistani legislators must spend a significant amount of time and effort in proposing development projects in their constituencies, after which the funds are disbursed directly to the implementing department. I therefore argue that the variation in total development spending by a legislator is interpretable as effort. The results show that total development fund spending, or effort, is negatively associated with rainfall. This evidence is consistent with my theoretical framework given Pakistan's incumbency disadvantage, and highlights politician effort as the mechanism behind the reduced form results.

The remainder of this paper is organized as follows. Section 2 presents a simple theoretical framework which highlights how an exogenous shock, rainfall, can impact a politician's probability of re-election in a rational Bayesian framework. In Section 3, I discuss the South Asian political context. Section 4 presents and discusses the empirical strategy and the central results of this paper. In Section 5, I test the effort mechanism for politician behavior. Section 6 concludes.

2 Theoretical Framework

2.1 Political Agency Set-up

I first lay out a simple political agency model with both adverse selection and moral hazard that describes rational voter behavior with Bayesian updating, following Besley (2006) and Banks and Sundaram (1998). This model formalizes the notion that rational voters will only change their voting behavior if politician behavior changes. There are two types of politicians, good (g) and opportunistic (b). The ex-ante probability of a randomly selected politician being good is π; this is also the prior that the incumbent is good. The incumbent politician takes action $a\epsilon[\underline{a}, \overline{a}]$. I assume that good types always undertake the best action, $\overline{a}$, and opportunistic types undertake their action based on their personal utility function. Specifically, I identify two mechanisms for how the behavior of opportunistic politicians might change with rainfall, effort and corruption, and I describe their optimization problem in detail in the following section.

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Higher values of the action a are interpretable as better behavior. The action a stochastically determines a payoff to the voter, y, which is the realization of a random variable with CDF $F(y|a)$ and smooth density $f(y|a)$. The voter observes y but not the politician's action a (moral hazard or hidden actions). We assume that for all a, $a' \epsilon [\underline{a}, \overline{a}]$ with $a < a'$, $\frac{f(y|a')}{f(y|a)}$ is increasing in y, which means that higher levels of a make better outcomes for the voter more likely. The voter also does not observe whether the politician is good or opportunistic, but has the prior π that the incumbent is good (adverse selection or hidden types).

The voter will update his beliefs about the politician's type, based on his action a, using Bayes rule and will re-elect the incumbent if his belief that the incumbent is good is greater than the probability that a randomly selected challenger is a good type. Banks and Sundaram show that there is an equilibrium in which voters vote using a cut-off strategy, such that they re-elect in the politician if $y > y^*$. The good politician will always be re-elected, and since better actions make $y > y^*$ more likely, an opportunistic politician is more likely to be re-elected if he puts in a better action. The probability that voters re-elect the politician conditional on their action a is $p(a) = \Pr(y > y^*|a) = 1 - F(y^*|a)$.

2.2 Opportunistic Politicians

How do an opportunistic politician's incentives change with rainfall? In the effort model, rainfall affects the opportunistic politician-landowner's own farm, and therefore changes his incentives to put in farm labor versus political effort. In the corruption model, rain affects the constituents' aggregate income, and changes the opportunistic politician's incentives to steal from them. It is standard in the literature to model politician behavior as corruption. In recent work addressing similar issues of corruption and politician re-election, Campante, Chor, and Do (2006) show that greater instability leads the incumbent to embezzle more during his short window of opportunity. Similarly, Ferraz and Finan (2007) find that mayors in Brazil in their final term are significantly more corrupt than mayors who can still be re-elected.

However, the effort model is an alternative way of looking at politician behavior, and is especially relevant in the South Asian context where many politicians are landowners and must also spend time and effort in the political arena. The corruption and effort stories yield analogous results for politician incentives but have very different implications in terms of their welfare effects: the corruption model posits the politician as an extorter whereas the effort model implies that he is a more benign citizen-candidate. I can test whether the effort model is consistent with politician

behavior in the South Asian context; however, I cannot directly test for the corruption model because of lack of data on corruption.

2.2.1 Effort Mechanism

The main motivation for the effort model for politician behavior is the fact that a majority of politicians in South Asia own agricultural land in the constituencies from which they are elected; they are actually referred to as landowner-politicians. In terms of the politicians I study in this paper, agriculture is the primary occupation of 34% of MNAs, legislators who were elected to the Lower House of Parliament, in Pakistan, in 2002. It is the occupation of 50% (or slightly more in some years) of MPs elected to the Lok Sabha, the Lower House of Parliament in India, in 1991, 1996, 1998 and 2004. These numbers are an underestimate for the time period under study in this paper, which is before 1999 for both countries, given that the agricultural population has gone down over time. The Pakistan number is an additional underestimate for two reasons: i) agriculture tends to be the secondary occupation for many politicians as well, and ii) a policy change prior to the 2002 elections barred all candidates who did not have a Bachelors degree from contesting elections; to the extent that landowner-politicians are less educated and could not contest the 2002 elections because of the education requirement, 34% is an underestimate for the time period under study in this paper.

The opportunistic landowner-politician can spend time and effort on his farm (one can think of this as monitoring or supervision time as well) or in the political arena. Farm production is determined by rainfall and the politician's labor on the farm. The politician thus faces a trade-off between his farm labor and political effort, because the latter increases his probability of re-election but the former increases current income.

Formally, the opportunistic politician faces the following utility maximization problem: he chooses political effort, e, to maximize

$$U = (p(e) + c)U(R^\alpha L^{1-\alpha} + W) + (1 - p(e) - c)U(R^\alpha L^{1-\alpha}) \text{ s.t. } e + L \leq T.$$

Production on the farm is given by $R^\alpha L^{1-\alpha}$, where R is rainfall and L is farm labor. $p(e)$ is the probability of re-election given effort e; this probability is increasing in effort. A positive c defines incumbency advantage, and a negative c defines incumbency disadvantage. W is the benefit from re-election. The time constraint $e + L \leq T$ will be binding, so the optimal choice of e determines L. The politician's utility function exhibits diminishing marginal utility: that is, $U'() > 0, U''() < 0$; this is important for the main result of the model.

The main results are as follows:

Result i: When there is a high enough incumbency advantage (high, positive c), opportunistic politicians increase effort with higher rainfall; and when there is a high enough incumbency disadvantage (negative c), opportunistic politicians lower effort with better rainfall. Formally, for positive enough c, $\frac{\partial e}{\partial R} > 0$, and for negative enough c, $\frac{\partial e}{\partial R} < 0$; this is true if W, the benefit from re-election, is sufficiently large, $p(e)$ is concave (diminishing marginal returns to effort), and $U''' = 0$ (no precautionary motive). This result stems from the fact that there is diminishing marginal utility.

Result ii: The response of effort to rainfall is monotonically increasing in incumbency advantage; that is, $\frac{\partial e}{\partial R}$ is increasing in c, or $\frac{\partial}{\partial c}(\frac{\partial e}{\partial R}) > 0$. This is true if $U''' = 0$.

Proof: in Appendix A.

2.2.2 Corruption Mechanism

The main motivation for the corruption mechanism is that the incumbent can steal from his voters. This extortion takes the form of bribes from his constituents, whose incomes increase with better rainfall. Voters will update their beliefs according to Bayes rule upon observing corruption, and will not re-elect the incumbent conditional on him undertaking corrupt activities.

The opportunistic politician can choose how much to steal, α, from constituency income, which depends on rainfall. Formally, the politician chooses α to maximize:

$$U = (p(\alpha) + c)U(\alpha f(R) + W) + (1 - p(\alpha) - c)U(\alpha f(R))$$

where constituency income $f(R)$, depends on rainfall R; α is the proportion of constituency income the politician chooses to steal, and $p(\alpha)$ is the probability of re-election given corruption α; this probability is decreasing in α. As before, a positive c defines incumbency advantage, and a negative c defines incumbency disadvantage. Finally, as in the effort model, W is the benefit from re-election, and $U()$ exhibits diminishing marginal utility.

Result i: When there is a high enough incumbency advantage (high, positive c), opportunistic politicians lower corruption with higher rainfall; and when there is a high enough incumbency disadvantage (negative c), opportunistic politicians increase corruption with better rainfall. That is, for positive enough c, $\frac{\partial \alpha}{\partial R} < 0$, and for negative enough c, $\frac{\partial \alpha}{\partial R} > 0$; this is true if W is sufficiently large, $p(\alpha)$ is convex, and $U''' = 0$.

Result ii: The response of corruption to rainfall is monotonically decreasing in incumbency advantage; that is, $\frac{\partial \alpha}{\partial R}$ is decreasing in c, or $\frac{\partial}{\partial c}(\frac{\partial \alpha}{\partial R}) < 0$. This is true if $U''' = 0$.

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Proof: in Appendix A.

2.3   Intuition

Table 1 contains a summary of the results of both models. Opportunistic politicians behave better (in terms of higher effort and lower corruption) with better rainfall in times of incumbency advantage, and they behave worse (lower effort and higher corruption) in times of incumbency disadvantage. What is the intuition for this result? In the corruption case, as c increases (as we move into the case of incumbency advantage), the incumbent is more likely to get W; in this case, when rainfall R goes up, the politician reduces corruption (α) because of diminishing marginal utility. Similarly, in the effort model, as c increases, the incumbent is more likely to get W, and when R increases, he lowers effort on the farm (L) and so increases political effort (e). This can be termed the "income" effect of increasing rainfall, which is to make the opportunistic politician substitute into better politician behavior and it exists in times of incumbency advantage precisely because the politician is more likely to get the benefit from re-election in these times. The "substitution" effect, which is to make the opportunistic politician substitute into worse political behavior exists in times of incumbency disadvantage because the politician is less likely to get the benefit from re-election and therefore he will substitute into activities that make money now.

Figures 1 and 2 depict the $p()$ functions graphically. What does it mean for $p(e)$ to be concave and for $p(\alpha)$ to be convex, which are assumptions we need for the above results to hold? It means that an increase in effort at lower levels is rewarded at a higher rate than the increase at higher levels of effort, that is, there are diminishing marginal returns to effort (Figure 1). The fact that $p(\alpha)$ is convex means that the politician is increasingly more likely to be punished the higher the α (Figure 2). It is reasonable to assume that voters reward lower levels of effort at a higher rate and penalize higher levels of corruption at a higher rate.

2.4   Testing the Model

This theoretical framework formalizes a number of ideas: the relationship between effort and corruption (and therefore probability of re-election) and rainfall can be positive or negative depending on the underlying political environment. Specifically, opportunistic politicians behave better and are therefore more likely to be re-elected with better rainfall in times of incumbency advantage, and they behave worse and are less likely to be re-elected in times of incumbency disadvantage. Good politicians always undertake the best action, and therefore their likelihood of election does

not change with rainfall.

Therefore, political selection varies with better rainfall: in times of incumbency advantage, opportunistic types behave better with better rainfall, so more of them will be re-elected, which means worse selection with rainfall; and in times of incumbency disadvantage, opportunistic types behave worse with better rainfall, so less of them will be re-elected, which means better political selection with rainfall.

Both the mechanisms for politician behavior presented here, effort and corruption, give the same predictions about the direction of politician behavior under different political environments, but are based on different motivations for the politician, and have different implications for the voter. In the effort framework, rainfall affects the politician's personal income, and the model rests entirely on the fact that he is an agriculturist, whereas in the corruption framework, rainfall affects constituency income. On the voter's side, the welfare implications of the models are different as well: the corruption model posits the politician as an extorter whereas the effort model implies that he is a more benign citizen-candidate.

Can we distinguish between the effort and corruption mechanisms empirically? I can use two pieces of data to test the effort model: first, I have data on development fund spending in Pakistan, which I argue can be interpreted as effort (description and explanation in Section 5) and I can look at whether spending responds to rainfall in the manner predicted in this model. Second, I have data on occupations of MPs elected in three election years in India, and can therefore look at whether the rainfall effect exists only for politicians who are also agriculturists. Although I can directly test for the effort mechanism, I cannot do so for corruption because of lack of data on corruption. Results consistent with the effort mechanism do not rule out the corruption mechanism also being at play; both mechanisms for behavior may be occurring at the same time.

2.5 Irrational Voter Model

In contrast to the above framework, the irrational voter will not base his vote on his belief about the politician's type, and he will not update this belief using Bayes rule; rather he will re-elect the incumbent when his payoff under the incumbent's government is (equal to or) higher than a certain threshold. One can think of this in terms of the incumbent's probability of re-election increasing as the voter's payoff increases[3]. In this case, the politician's action is not affected by

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[3]This latter framework guarantees that there are no perverse effects of having a fixed re-election threshold on the politician's action, i.e., it ensures that (bad) politicians do not put in the bad action when there is no rainfall or when there is a bad state of the world just because they know that they will not be able to reach the threshold even

rainfall, but voters are always more likely to re-elect the incumbent when there is better rainfall because voters' income is higher. It is critical to note that this occurs regardless of the underlying political environment, and this is in contrast to my model, whose predictions depend on the political environment.

3 Political Context and Data

3.1 Pakistan

3.1.1 Background

Pakistan has a parliamentary system of government. The politicians I study are Members of National Assembly, or MNAs, who are national-level legislators in the Lower House of Parliament (called the National Assembly)[4]. There were 207 National Assembly constituencies from 1988 to 1997, the time period under study in this paper. These constituencies are single-seat electoral districts, and the MNAs are elected under plurality rule; that is, the candidate with the most votes wins. Each party can field one candidate per constituency, and a large number of independent candidates run for election as well[5]. The majority party or a coalition of parties then forms government. The Prime Minister is elected by the National Assembly, and is generally the head of the majority party in the National Assembly. Legislators do not face term limits in Pakistan.

The time duration under study in this paper was a purely democratic period in Pakistan between two military regimes. Elections were competitive, with a large number of candidates and parties contesting them. There were four elections between 1988 and 1997. Elections were not held at fixed times because no government was allowed to complete its term; rather, each National Assembly was dissolved by the President prior to completing its term and early elections were held within three months, as dictated by the Constitution. There were a number of reasons the National Assembly

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if they do put in the good action. One can also guarantee that there is no perverse effect from a fixed threshold if the politician is uncertain about the exact threshold value.

[4]The National Assembly in Pakistan is analagous to the United States Congress, and the politicians I study are analagous to members of Congress.

[5]Interestingly, candidates can stand for election from more than one constituency, and can therefore win from more than one constituency as well. In practice, there are a few strong candidates in every election who win from multiple constituencies. When that occurs, the candidate must resign from all winning seats but one, and bye-elections are held in the constituencies where he resigned. For these constituencies, I encode the incumbent politician as the one who is in power for the duration between the current election and the next election; specifically, if the winner resigns, the bye-election winner is denoted as the incumbent. This makes sense because it is the incumbent's performance that voters are evaluating. However, I denote the person who wins the election the first time around as the winner, since he is the first preference of voters.

was dissolved in each term, but government corruption was always cited as one of them[6].

The election data is from the Election Commission of Pakistan for the four elections between 1988 and 1997[7]. For each election, the Election Commission releases detailed election results by constituency, including the names of candidates, their party affiliations, votes polled for each candidate, and voter turnout in each constituency.

3.1.2 Incumbency Disadvantage

An incumbency advantage (disadvantage if negative) is defined as the causal advantage attributed to being an incumbent. It cannot simply be calculated by running a regression of probability of election in the next period on incumbency status because there may be other confounding factors correlated with incumbency; specifically, a candidate may both be an incumbent and more likely to be elected again simply because he is a good leader. We can tease out the causal incumbency advantage using the difference in the probability of winning in the next time period between someone who just won and someone who just lost this election, the idea being that they will be similar on all other dimensions; therefore we can employ regression discontinuity design for this purpose, following Lee.

I run two alternate regressions, a quartic polynomial and a piecewise linear regression, to estimate incumbency (dis)advantage in Pakistan, following Linden's work estimating India's incumbency (dis)advantage. He documents that the results from a non-parametric regression discontinuity estimation are very similar to the results from piecewise linear and quartic specifications. In the quartic polynomial specification, I regress election in the next time period on a quartic polynomial in the vote margin in this time period along with an indicator for whether the politician is an incumbent; in this way, controlling parametrically for the vote margin, the coefficient on incumbent captures the discontinuity and hence the causal incumbency advantage. The vote margin is defined as follows: for the winner, it is his vote share minus the vote share of the runner-up; for the loser, it is his vote share minus the winner's vote share[8]. The specification is as follows:

$$\Pr(elect)_{ict+1} = \alpha_c + \beta_t + \gamma I(Incumbent_{ict}) + \theta_1 VoteM \arg in_{ict} + \theta_2 VoteM \arg in_{ict}^2 + \theta_3 VoteM \arg in_{ict}^3 +$$
$$\theta_4 VoteM \arg in_{ict}^4 + \varepsilon_{ict}$$

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[6]Infact, in calculating my rainfall measures, I exclude the rainfall in the three months directly prior to the election because the incumbent was not in power then; I therefore use rainfall in the twelve months prior to the Assembly dissolution. Later, as a falsification test, I also confirm that rainfall during the three months while the National Assembly was dissolved is not related to re-election.

[7]I thank Asim Khwaja for sharing the soft copy of this data with me.

[8]The constituencies on either side of the margin are very similar along a number of dimensions, such as number of voters and number of candidates, lending validity to this approach. These results are available upon request.

The piecewise linear specification regresses election in the next time period on an indicator for whether the politician is an incumbent, using a spline estimator with knots at vote margin levels -45, -35, -25, -15, -5, 0, 5, 10, 15, 25, 35, and 45, and constituency and year fixed effects. The results from both specifications are in Table 2. The coefficient on incumbent measures the incumbency disadvantage, and the results show there is a large incumbency disadvantage in Pakistan, to the order of about -13 to -16% for the time period under study in this paper.

3.2   India

In India, we study MPs (Members of Parliament), who are members of the Lok Sabha (literally, the House of the People), the Lower House of Parliament. I have data from the Election Commission of India for the eight elections held between 1977 and 1999. For each election, I have detailed election results by constituency, including candidate names, votes polled, and party affiliations[9]. There were 543 Lok Sabha constituencies in this time period, but election results are reported consistently for only 504 of them. Similar to Pakistan, these are first-past-the-post elections.

Linden (2004) shows that there was a fundamental shift in the Indian political arena in 1991: from a system dominated by one party, it became one that was fundamentally multi-party in that no single party could be counted on to control Parliament. Political competition increased as well, with a higher number of candidates and political parties contesting election in each constituency. Most importantly perhaps, it changed from an environment of incumbency advantage to one of an incumbency disadvantage post-1991. Elections were not held at fixed times between 1989 and 1999 in India, similar to Pakistan in the 1990s; this was primarily due to the fact that governments were not formed by a single party and the coalition governments tended towards instability.

Table 3 documents incumbency effects by year using the same spline specification as the one described above. The coefficients in the table measure the effects of incumbency on election in the next time period, with a piecewise linear regression in the vote margin. The results document the shift from incumbency advantage to disadvantage as the coefficients shift from positive to negative in 1991. Although the incumbency coefficients are not individually significant, estimating the effects separately pre-1991 and post-1991 yields significant positive and negative coefficients respectively.

Table 4 shows that the incumbency effects (again, using the spline specification) differ by party affiliation of the incumbent; specifically, by whether or not he belongs to the Indian National

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[9]I am grateful to Leigh Linden for sharing the soft copy of this data and his measure of candidate re-election with me.

Congress Party. Before 1991, the incumbency effect was positive and significant only for Congress Party incumbents, which shows that the incumbency advantage was actually specific to Congress incumbents, whereas non-Congress incumbents appeared to have no advantage. After 1991, the incumbency effect was negative for both Congress Party and non-Congress Party incumbents; while incumbents belonging to all parties suffered an incumbency disadvantage, this appeared stronger (although not significantly so) for Congress incumbents.

Why does incumbency advantage and disadvantage exist, and why was there a shift from advantage to disadvantage in India in 1991? This is something that has not been adequately addressed in the literature, although there have been a few attempts to study this. Linden (2004) argues that the dominance of a single political party (the Indian National Congress) before 1991 may have provided a framework in which experience was valuable because incumbents who gained experience under the Congress system would interact with the same system when re-elected. Starting in 1991, however, no party could be counted on to control parliament, making experience under the previous regime potentially less valuable.

More generally, I postulate that incumbency advantage may be a feature of an environment with low political competition, in terms of a small number of candidates and parties running, as in India before 1991; voters may have believed Congress incumbents were better than any of the small number of non-Congress challengers because they had low priors about these challengers. On the other hand, incumbency disadvantage may be a product of an environment with high political competition, and a large number of candidates and parties running, as in India post-1991; the high political competition may have given rise to high priors about the large choice of challengers post-1991, and led to voters voting out the incumbent.

4 Empirics

4.1 Empirical Strategy

I regress the probability of re-election on rainfall, controlling for election year and constituency fixed effects, as follows:

$$\Pr(reelect)_{ct} = \alpha_c + \beta_t + \gamma Rain_{ct} + \varepsilon_{ct}$$

where:

$Rain_{ct}$ is rainfall in constituency c at time t. I begin with two main measures for $Rain_{ct}$:

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i) average annual rainfall in the duration between each election, and

ii) rainfall in the year prior to the election (if voters remember more about the immediate past).

The literature on the relationship between rainfall and agricultural production in South Asia states that the ratio of annual rainfall to mean annual rainfall is a strong predictor of crop yield[10]. In accordance with this work, I take the ratio of the rain measures identified above to mean annual rainfall (defined as average rainfall in the constituency over the 1950-99 time period) as my preferred measure of $Rain_{ct}$. This ratio measure amounts to a proportional deviation of rainfall from average rainfall. Two other specifications are also tested to check for robustness: log of rainfall (which is equivalent to the log of the ratio measure when there are constituency fixed effects) and level of rainfall (which is equivalent to rainfall deviations when there are constituency fixed effects)[11].

α_c are constituency fixed effects, where c refers to 207 national-level electoral constituencies in Pakistan, and 543 national-level electoral constituencies in India. β_t are (re)election-year effects, where t refers to election years 1990, 1993, and 1997 in Pakistan, and election years 1980, 1984, 1989, 1991, 1996, 1998, and 1999 in India.

$\Pr(reelect)_{ct}$ for a constituency c at time t is defined in both of the following ways:

i) Pr(Candidate re-election): equals 0 if incumbent politician is not re-elected; 1 if incumbent legislator is re-elected in constituency c at time t[12].

ii) Pr(Party re-election): equals 0 if the incumbent political party is not re-elected; 1 if the incumbent party is re-elected in constituency c at time t.

Party and candidate re-election may not correspond exactly for two reasons:

i) The incumbent politician may not run for re-election in the same constituency, and maybe not even in any other constituency, but the party is very likely to field a candidate in that constituency again. Given that I record candidate re-election unconditional on running for election, there is no difference between these two measures if the party is not re-elected. The discrepancy between the two exists when the incumbent performed well, and the constituents would have liked to re-elect him but he chooses not to run again from that constituency, and so is not re-elected (he could choose to run from a different constituency, for different office, let a family member run in his place, or retire); but the party runs and is re-elected. Therefore voters are always able to reward

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[10]See Jayachandran (2006).

[11]The results are similar across specifications and are available upon request.

[12]This does not take into account whether the incumbent politician ran for re-election or not. The results are similar for candidate re-election conditional on running. However, candidate re-election unconditional on running is the right measure to use, as an incumbent's decision to run also contains information on whether he expects to win or lose.

the performance of the incumbent by re-electing the party, and in that sense party re-election is a better measure to use to study retrospective voting.

ii) Candidates may switch parties. This is a prevalent phenomenon in South Asia. If candidates switch parties, voters can vote retrospectively along either the candidate or the party dimension, but not both. There is reason to believe that parties are the dimension along which voters vote retrospectively in South Asia. One of the reasons this may be manifested is because of the use of party symbols: each party is allocated a different symbol by the Election Commission and it campaigns using this symbol. On the ballot box are names of the candidates, their parties, and the image of the associated symbol of each party. Many voters, especially in rural areas, cannot read properly and vote on election day based on the image of the party's allotted symbol and not the name of the candidate.

Finally, these elections take place at the national level and determine the party composition of Parliament, which in turn determines which party forms government and policy. It therefore makes sense to vote along party dimensions in these elections. For the rest of the paper, I will present and discuss the party re-election results; the candidate re-election results, which are similar to the party results, are in the Tables Appendix. The summary statistics for candidate and party re-election are in Tables A1 and A2, for India and Pakistan respectively. Average party re-election is around 45-50% for both countries, while candidate re-election is around 30-35% on average. This may exactly reflect the discrepancy between party and candidate re-election which I identified in (i) above: if the incumbent does not run again from the constituency but he performs well, his constituents would like to re-elect him; since he does not run again, he is not re-elected, but the party typically does run and is re-elected.

4.2 Rainfall Data

The rainfall data used in this paper is from the Center for Climatic Research at the University of Delaware, specifically from their Global Precipitation Monthly and Annual Data Series for 1950-99. This rainfall data is available at a 0.5 degree by 0.5 degree longitude-latitude grid. To compile this data series, researchers combined data from 20 nearby weather stations, using an interpolation algorithm based on the spherical version of Shepard's distance-weighting method.

In order to match this rainfall data to Indian and Pakistani electoral constituencies, I calculated the distance between the center of each constituency and the Delaware grid using the Haversine

formula for measuring distance between two longitude-latitude points[13], and matched each constituency to the closest point on the grid. For Pakistan, I calculated constituency centroids using GIS maps of electoral constituencies that I constructed for an earlier project[14]. For India, the centroids of each constituency are available on the Election Commission website.

Using the longitude-latitude distance matching process, I matched Pakistan's 207 electoral constituencies to 125 unique grid points. In all my regressions, I cluster the standard errors at the longitude-latitude grid point from the Delaware database. The average distance between the grid and the constituency center for Pakistani constituencies is 20.8km (SD=8.5, min=1.6, max=49). Similarly, I matched India's 542 Lok Sabha constituencies to 327 grid points, with an average distance of 20.5 km between the Delaware grid and the constituency center (SD=8.4, min=1.5, max=51)[15].

In South Asia, more rain improves agricultural productivity; my measure of rainfall, the proportional deviation from mean rain, strongly and monotonically predicts crop yield. This is in contrast to other environments in which rainfall above or below the average can hurt crop production[16]. However, extremes on both ends, floods and droughts, may be harmful. In my empirical work, I drop these outliers.

4.3   Main Results

Tables 5 to 7 present the central empirical results of this paper for both India and Pakistan. These tables present results for party re-election as the outcome variable for the reasons outlined in my empirical strategy; the corresponding candidate re-election results are in Tables A3 to A5 of the Tables Appendix C. I use both measures of rainfall defined earlier, annual rainfall in the duration between elections and rainfall in the year prior to the election, divided by mean annual rainfall in the constituency. As hypothesized, party re-election appears to be very strongly related to rainfall, while candidate re-election is weakly so (significantly related for prior year rainfall for India, and not at all for Pakistan across all specifications). Therefore, parties are the dimension along which voters appear to be voting retrospectively.

Table 5 presents the main results for India, divided into the time of incumbency advantage (pre-

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[13]I am grateful to Seema Jayachandran for sharing her longitude-latitude matching program with me.

[14]Afzal, "Restricted Candidacy and Political Competition: Evidence from a Policy Change in the Minimum Education Requirement for Legislators in Pakistan", Mimeo, May 2006.

[15]India's Lok Sabha has 543 constituencies. Lakshadweep, a set of islands, was dropped from the analysis because longitude-latitude data did not exist for a point close to it. In particular, the closest point to which it could be matched was 337 km away.

[16]Jayachandran (2006), p.554-6.

1991), and the time of incumbency disadvantage (post-1991). Both measures of rainfall, duration and prior year rain, are significantly positively related to re-election prior to the 1991 elections, and negatively related to re-election post-1991. Consistent with the theoretical model, the negative relationship between rainfall and re-election exists in times of incumbency disadvantage, and the positive relationship exists when there is an incumbency advantage. The model argues that this reflects better politician behavior with higher rainfall in times of incumbency advantage, and worse politician behavior with higher rainfall in times of incumbency disadvantage.

In terms of magnitude, the India results suggest that a 30% increase in annual rainfall relative to the mean (a one standard deviation change) over the duration that the incumbent was in power increases the probability of his party being re-elected by 15% pre-1991, whereas a 30% increase in the same measure post-1991 decreases the probability of the incumbent's party being re-elected by 5%. A 30% increase in rainfall in the year prior to the election is associated with a 7% increase in the probability of the party being re-elected pre-1991, and a 6% reduction post-1991. These numbers are moderately large. The results are strong for both the duration rainfall measure as well as the prior year rain measure, although they are more significant for the latter post-1991, consistent with the view that voters remember the most about the last year prior to the election rather than the entire duration.

Table 6 breaks up the rainfall-re-election relationship for India by election year. The pattern of coefficients shows that the shift from a positive effect of rainfall on re-election to a negative effect occurred exactly in 1991. This pattern is broadly similar to the pattern of yearly incumbency effects for India shown in Table 3. The effect is larger for some years and smaller for others, and the coefficients are not all significant, but they show a break in 1991 from positive to negative coefficients.

Table 7 (Columns 1 and 3) presents the rainfall-re-election relationship for Pakistan. Both measures of rain are significantly negatively related to re-election in Pakistan, which is consistent with the theoretical framework given that there is an incumbency disadvantage in Pakistan. Again, I argue that this negative relationship between electoral outcomes and rainfall reflects worse politician behavior in times of incumbency disadvantage. In Pakistan, a 30% increase in both measures of rainfall (a one standard deviation change), duration as well as prior year, relative to mean rainfall, decreases the probability of the incumbent's party being re-elected by 6%[17].

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[17]Prior year rainfall for Pakistan is rainfall in the 12 months prior to the dissolution of government, that is, rainfall between 15 months prior to the election and 3 months prior to the election when the government was dissolved.

Rainfall increases constituency income through crop productivity, and the measure of rainfall I use is monotonically related to crop productivity in South Asia. Therefore, the relationship between rainfall and re-election should exist primarily in rural areas, and it should be stronger the more rural the constituency. For Pakistan, I have data on the proportion of the population living in urban areas at the district level through the Census[18]. I have this data for one Census year, 1998, so there is no time variation in this variable. In Columns 2 and 4 of Table 7, I interact the rainfall measures with the proportion of people living in urban areas in that constituency. This interaction term is very small and not significant, which shows that the rainfall-re-election effect comes through rural areas in Pakistan, as we would expect. It is important to note that this result is consistent with both the effort and the corruption mechanisms for politician behavior, because the effort mechanism goes through politician-landlords, and in the corruption mechanism, rainfall increases constituency income through aggregate crop production.

These results are not consistent with an irrational voter response to luck. Specifically, an irrational voter model would imply that politicians are always more likely to be re-elected when there is better rainfall given that this improves voter income, and this would hold regardless of the underlying political environment of incumbency advantage or disadvantage. My results show that politicians are actually *less* likely to be re-elected in times of incumbency disadvantage, which shows that the irrational voter model is definitely not at play during those times. Politicians are more likely to be re-elected during times of incumbency advantage, but unless voters also shifted from being irrational pre-1991 to rational post-1991, which is hard to believe, my results cannot be explained by an irrational voter model.

4.4 Effects by Party

If incumbency advantage or disadvantage varies across politicians, we would expect their behavior to differ, and hence electoral outcomes to differ. Table 4 suggests that incumbency advantage and disadvantage varies by party affiliation. As seen in the table, in India, the incumbency advantage pre-1991 was really a Congress Party advantage, exclusive to incumbents belonging to the Indian National Congress Party[19]. Given this, we should expect the pre-1991 positive relationship between rainfall and re-election to be exclusive to incumbents belonging to the Congress Party. Post-1991,

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[18]There are twice as many electoral constituencies as administrative districts in Pakistan during this time period. I matched constituencies to districts using a detailed breakdown of constituencies into administrative units using a file provided by the Election Commission.

[19]Linden (2004).

the incumbency disadvantage exists for both Congress as well as non-Congress incumbents, although it is slightly stronger (although not significantly so) for Congress incumbents.

In Table 8, I look at the difference in the relationship between rainfall and re-election for Congress versus non-Congress incumbents, by interacting rainfall with an indicator for whether the incumbent belonged to the Congress Party. Pre-1991, the rainfall-Congress interaction term is positive and significant, and large in terms of magnitude (to the order of a 4.7-6.7% increase in re-election probability with a 10% increase in rainfall for Congress incumbents), for both the prior year and duration rainfall measures. On the other hand, the main rainfall term, which signifies the effect for incumbents who do not belong to the Congress Party, is now small and insignificant. Therefore, pre-1991, given that the overall incumbency advantage is driven through Congress incumbents, the positive relationship between rainfall and re-election is also driven exactly through Congress incumbents.

Post-1991, non-Congress incumbents shift from facing no incumbency advantage to a disadvantage, and Congress incumbents shift from facing an incumbency advantage to disadvantage. Accordingly, we see that the positive relationship between rainfall and re-election for Congress incumbents that existed pre-1991 is driven down post-1991, and it becomes negative for non-Congress incumbents.

4.5   Weather Effect? Election Day Rainfall

Rainfall on the election day may directly affect re-election through a pure weather effect, without going through the channels of crop production and politician incentives. That is, election day rainfall could systematically change voter turnout, and this in turn could affect election outcomes. Specifically, this rainfall may deter voters from leaving home or work to go to the polling station simply because it is inconvenient to do so, thereby reducing voter turnout. On the other hand, rainfall may make it inconvenient to work outdoors, and more farmers may be able to leave work that day in order to vote. Either way, a relationship between rainfall on election day and voter turnout is suggestive of some sort of selection of voters in response to the weather, which may then affect election outcomes and thus re-election.

I test for this using rainfall in the election month as a proxy for election day rainfall. This proxy, although imperfect, is quite relevant in South Asia because elections are staggered over a period of about a month across different constituencies, given the sheer scale of voting by such a large population. I regress the log of voter turnout in the election (to look at proportionate effects

on turnout) on rainfall in the election month. The results, which are in Table 9, show that there is no significant effect of rainfall in the election month on voter turnout, therefore we see no evidence of a pure weather effect on voting.

4.6 Falsification Test: Exploiting Assembly Dissolution

As mentioned earlier, the national government was dissolved prematurely after each of the four elections under study in Pakistan, and new elections were held within three months of this dissolution of the National Assembly. I can exploit this feature of the political environment as a robustness check, by testing for whether there is any relationship between rainfall in these three months when the Assembly was dissolved and re-election. The idea behind this test is that politicians are not in power during this time, therefore politician behavior does not exist and cannot change during this time due to rainfall. Given that politician behavior cannot change, rational voters should not respond to rainfall during this time.

The measure of rainfall I use for this purpose is analogous to the measures used earlier: it is the ratio of rainfall in the constituency in the three months in which the Assembly is dissolved, to mean rainfall in the constituency in those three months. I look at the relationship between re-election and this rainfall measure in Table 10. The results show that there is no relationship between re-election and rainfall during the months of Assembly dissolution; the coefficient is small and statistically insignificant. Therefore, given these results, I cannot reject the null hypothesis of rational voter behavior.

5 Effort Tests

5.1 Development Fund Spending

Development funds have been allocated to each legislator in Pakistan in every year since 1985 to spend on various development projects in his/her constituency. The name of the program has varied with successive governments, but the overall mandate remains the same: provision of development schemes to communities by their elected representatives. Development funds were allocated to MNAs under the Peoples Programme in 1988-90 and 1993-97, and under the Tameer-e-Watan Programme in 1991-93 and 1998-2000. MNAs can spend these funds on projects in the broad areas of health, education, roads, water supply, drainage and sanitation, electrification, gas, construction,

establishment of public call offices, and certain miscellaneous fields[20]. For example, the funds could be used to help with the establishment of a basic health unit (BHU, a primary level public health care facility) or an elementary school for boys, or both. In the time period under study, the highest amount of money spent by legislators was on road projects.

How does MNA development fund spending work in the Pakistani context? Each MNA is allocated the same amount of money in each budget year. However, the key thing to note is that this money is not handed over to them at the start of the year to spend as they wish. MNAs must propose the exact projects that they wish to be implemented. In this proposal, they must also submit a detailed cost estimate, as well as suggest executing agencies who can implement the project. This proposal is then put through a process of bureaucratic approval. The projects are approved at the top by the heads of a federal ministry and an implementation agency is assigned[21]. Funds are then disbursed directly to the executing agency selected for project implementation, and the project is underway.

The entire amount allocated for development fund spending in every year is not spent by many MNAs, similar to the situation with Indian MPLADS (Member of Parliament Local Area Development Scheme), the analogous development program for Lok Sabha legislators in India[22]. Table 11 contains summary statistics for total development fund spending over the time period under study in this paper. As the table shows, many MNAs spend less than the allocated amount; some spend more; and some do not propose projects at all[23]. This variation in total development spending provides a very useful measure for legislator effort. Since there is a considerable amount of effort required to decide on projects and propose them with a detailed cost analysis, total spending by MNAs can plausibly be interpreted as effort expended by them in pursuing their political duties towards their constituents. This interpretation of total funds spent as effort was confirmed by a senior Ministry officer[24]. This is an especially useful measure of legislator behavior given that

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[20]The Pakistan Ministry of Local Government and Rural Development generously provided detailed development fund spending data for this paper, including data on the number of projects implemented and the amount of funds spent by each MNA under each broad area, in each year.

[21]Specifically, the Secretary and Minister of Local Government and Rural Development Ministry is responsible for final approval of the proposal. If the cost estimate exceeds the allocation, the projects are prioritized according to cost. These cost estimates are also verified by the AGPR (Accountant General, Pakistan Revenue) office in consultation with the designated executing agency. The majority of projects are implemented by the Pakistan Public Works Department, followed by the Local Government and Rural Development Department and the Water and Power Development Agency.

[22]See Keefer and Khemani (2007) for an analysis of MPLADS in India.

[23]The latter group of MNAs is missing in the data provided by the Ministry, and a Ministry officer confirmed that this was so because they had not spent their development fund money in that year. A majority of MNAs could not spend any funds in 1996-7 and 1999-00 because the government was dissolved during these years.

[24]Keefer and Khemani (2007) also interpret MPLADS similarly.

voting in the legislature is not recorded in Pakistan. It is also salient given that development schemes form a large part of what constituents expect from their legislators in Pakistan. Higher development spending should not be interpreted as higher corruption because the money is directly spent by the implementing agency and not by the politician; even if there is an opportunity for some collusion between the implementing department and the politician (most government officials say that the proportion skimmed by the MNA could not be more than 10% in the case of these development funds), the amount of corruption is likely to be small and the proportion skimmed is constant relative to amount of funds spent.

How can we test for the effort mechanism using development fund spending? Recall that the theoretical framework suggests that in times of incumbency disadvantage, politicians put in less effort when there is better rainfall. If there is a negative association between development fund spending, which is equivalent to effort, and rainfall in Pakistan, where there is an incumbency disadvantage, then this will provide support for the effort mechanism. Therefore, I run the following specification:

$$DevSpending_{ct} = \alpha_c + \beta_t + \gamma Rain_{ct} + \varepsilon_{ct}$$

A negative γ would provide support for the effort mechanism. Table 12 shows the results for this specification; I regress total development spending by an MNA on the prior year rain measure, which is strongly associated with re-election. I find that rainfall in the year prior to the election is associated with reduced development fund spending in that year in Pakistan, and the magnitude is very large: a 10% increase in rainfall reduces development fund spending in that year by 6 million Rupees, when the maximum allocation is usually 15 million Rs. This implies that good rainfall is associated with reduced politician effort, which is rational given that there is an incumbency disadvantage in Pakistan. This result therefore provides evidence consistent with the effort mechanism for politician behavior, although we cannot rule out that the corruption mechanism may also be at work.

5.2 Landowner-Politicians

The basic premise behind the effort mechanism is that politicians are also part-time agriculturists who divide their time between farming and the political arena. I have data on Indian MPs' occupations from a collection of biographies of MPs published on the Lok Sabha website. In terms of the election years under study in this paper, these biographies are available for the legislators who were elected in the 1991, 1996, and 1998 elections. There is very little missing data: out of

543 total MPs, biographies are available for 525 MPs elected in 1991, 528 elected in 1996, and 516 elected in 1998. For these biographies, MPs are asked to declare their occupation or profession, educational qualifications, their address, and some personal information, including their date of birth, marital status, and children. They can declare a number of different occupations; most MPs tend to declare two or three, the most common professions are agriculturist, political and social worker, trader, and lawyer. Other declared professions are teacher, businessman, and industrialist.

For most MPs, one profession is likely to be their main occupation, whereas others will be secondary ones. Many MPs list political and social worker as second or third professions, which is probably a by-product of their political job. I encode whether or not the politician is an agriculturist, and whether it is his only occupation. 50% or slightly more of MPs list "agriculturist" as one of their occupations in each of the three years for which I have the data; for approximately 10%, agriculture is their only profession. The latter measure is the relevant one to use for our purposes, since the effort mechanism is driven exactly by the trade-off between time on the farm and in politics, without any other occupation to divide time.

I use the following specification to test for whether the rainfall effect exists only for agriculturists:

$$\Pr(reelect)_{ct} = \alpha_c + \beta_t + \gamma_1 Rain_{ct} + \gamma_2 OnlyAgriculturist_{ct} + \gamma_3 Rain_{ct}*OnlyAgriculturist_{ct} + \varepsilon_{ct}$$

where $OnlyAgriculturist_{ct}$ signifies whether the incumbent MP's only other profession is agriculture.

The years for which I have the agriculturist data in India are the years of incumbency disadvantage. The rainfall-re-election relationship is negative during these years. In terms of the above regression, $\gamma_3 < 0$ and $\gamma_1 = 0$ would lend support to the effort mechanism, since it would imply that the relationship between rainfall and re-election is driven exactly by landowner-politicians.

Table 13 shows that the overall negative rainfall-party re-election effect during this time is infact driven by MPs whose only other occupation is farming[25]. The interaction term of rainfall and agriculturist is negative and significant (with a one-tailed test) for my preferred specification using party re-election and prior year rainfall. The magnitude of the interaction term is large: politicians whose only other occupation is agriculture are 4.5% less likely to be re-elected with a 10% increase in rainfall, compared to other politicians. The overall rainfall re-election relationship is weaker than my main results, because I have data on politician occupations for the incumbents elected in the 1991, 1996, and 1998 elections; I can therefore only use the 1996, 1998 and 1999 elections to look at re-election. As seen in Table 3 and Table 6, the overall incumbency effect and

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[25] Table A 6 in the Tables Appendix contains these results for candidate re-election.

the overall rainfall-re-election relationship is weaker for these years.

It is important to note that the "agriculturist" effect is not the same as the "rural" effect; recall that the rural data I use is available for only one year from the Census (there is no time variation in how rural the constituency is) and the rainfall-rural interaction measures whether the rainfall effect exists in rural areas versus urban areas. However, there is variation over time within a constituency in the agriculturist variable because a politician elected in one year may be an agriculturist and the one elected in the next year may not be one. Because we can control for constituency as well as year fixed effects, the effect of the agriculturist-rainfall interaction comes precisely from the variation within a constituency between incumbents who are agriculturists and those who are not.

6 Conclusion

This paper shows that politicians behave better when there is a good exogenous shock in times of incumbency advantage, and are therefore more likely to be re-elected in such times; and they behave worse in the presence of a good shock in times of incumbency disadvantage, and are thus less likely to be re-elected in such times. By appealing to changing politician incentives, I show that the relationship between exogenous shocks and electoral outcomes in South Asia can be consistent with rational voter behavior. This is in contrast to recent literature which documents a relationship between exogenous shocks and re-election in the US and argues that it is evidence of voter irrationality. This literature finds that politicians are more likely to be re-elected in lucky times and voted out in unlucky times. My theoretical model shows that this positive relationship between good shocks and re-election can be consistent with rational voter behavior when there is an incumbency advantage, which is the underlying political environment in the US (Lee). Specifically, politicians can behave better and are therefore more likely to be re-elected in times of incumbency advantage in the presence of a positive shock, because this shock has an "income" effect in such times.

I lay out a model which describes the effect of an agriculture-specific exogenous shock, rainfall, on politician behavior in terms of effort and corruption. The effort mechanism is especially relevant in South Asia where politicians are also agriculturists who are directly affected by rainfall. It is difficult to argue that US politicians are similarly directly affected by exogenous shocks such as weather or oil prices, and therefore the effort mechanism for politician behavior may be less relevant in the US context. Instead, corruption or some other behavioral mechanism may be pertinent here.

For example, good exogenous shocks increase income in the electoral district, and therefore may change the politician's incentives to extract kickbacks from their constituents, in the same manner as highlighted in the corruption mechanism in my theoretical framework. Understanding the exact mechanism for changes in US politicians' behavior in response to shocks is an interesting topic for future research.

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A Theoretical Appendix

A.1 Effort Mechanism:

Recall that the opportunistic politician's maximization problem with the effort mechanism is:

$U = (p(e) + c)U(R^\alpha L^{1-\alpha} + W) + (1 - p(e) - c)U(R^\alpha L^{1-\alpha})$ s.t. $e + L \leq T$.

Differentiating this with respect to political effort e gives his optimal choice for e and L:

$FOC: p'(e^*)U(R^\alpha L^{1-\alpha} + W) - (p(e^*) + c)U'(R^\alpha L^{1-\alpha} + W)(1-\alpha)R^\alpha L^{-\alpha} - p'(e^*)U(R^\alpha L^{1-\alpha}) - (1 - p(e^*) - c)U'(R^\alpha L^{1-\alpha})(1-\alpha)R^\alpha L^{-\alpha} = 0$

Differentiating the FOC with respect to R gives $\frac{\partial e}{\partial R}: \frac{\text{Numerator}}{\text{Denominator}}$

Numerator=

$-\{p'(e)\alpha R^{\alpha-1}L^{1-\alpha}[U'(R^\alpha L^{1-\alpha}+W)-U'(R^\alpha L^{1-\alpha})]-(p(e)+c)\alpha(1-\alpha)R^{2\alpha-1}L^{1-2\alpha}[U''(R^\alpha L^{1-\alpha}+W)-U''(R^\alpha L^{1-\alpha})]-\alpha(1-\alpha)R^{2\alpha-1}L^{1-2\alpha}U''(R^\alpha L^{1-\alpha})-(p(e)+c)\alpha(1-\alpha)R^{\alpha-1}L^{-\alpha}[U'(R^\alpha L^{1-\alpha}+W)-U'(R^\alpha L^{1-\alpha})]-\alpha(1-\alpha)R^{\alpha-1}L^{-\alpha}U'(R^\alpha L^{1-\alpha})\}$

Denominator=

$p''(e)U(R^\alpha L^{1-\alpha}+W)-2p'(e)U'(R^\alpha L^{1-\alpha}+W)(1-\alpha)R^\alpha L^{-\alpha}+(p(e)+c)U''(R^\alpha L^{1-\alpha}+W)(1-\alpha)^2 R^{2\alpha}L^{-2\alpha}-p''(e)U(R^\alpha L^{1-\alpha})+2p'(e)U'(R^\alpha L^{1-\alpha})(1-\alpha)R^\alpha L^{-\alpha}+(1-p(e)-c)U''(R^\alpha L^{1-\alpha})(1-\alpha)^2 R^{2\alpha}L^{-2\alpha}-(p(e)+c)U'(R^\alpha L^{1-\alpha}+W)(1-\alpha)\alpha R^\alpha L^{-\alpha-1}-(1-p(e)-c)U'(R^\alpha L^{1-\alpha})(1-\alpha)R^\alpha L^{-\alpha-1} = SOC < 0$

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The denominator is just the second order condition, and is always < 0. Therefore the sign of $\frac{\partial e}{\partial R}$ depends on the sign of the numerator, and we can focus on the numerator alone in the following.

Assume $U''(R^\alpha L^{1-\alpha}+W)-U''(R^\alpha L^{1-\alpha}) \approx 0$ which is true if $U''' = 0$ (no precautionary motive).

Result i:

We can see that:

i) When c is negative enough such that $p(e) + c = 0$ (in the limit), $\frac{\partial e}{\partial R} < 0$ if

$p'(e)\alpha R^{\alpha-1}L^{1-\alpha}[U'(R^\alpha L^{1-\alpha}+W)-U'(R^\alpha L^{1-\alpha})]-U''(R^\alpha L^{1-\alpha})(1-\alpha)\alpha R^{2\alpha-1}L^{1-2\alpha}-U'(R^\alpha L^{1-\alpha})(1-\alpha)\alpha R^{\alpha-1}L^{-\alpha} < 0$

ii) When c is positive enough such that $p(e) + c = 1$, $\frac{\partial e}{\partial R} > 0$ if

$p'(e)\alpha R^{\alpha-1}L^{1-\alpha}[U'(R^\alpha L^{1-\alpha}+W)-U'(R^\alpha L^{1-\alpha})]-U''(R^\alpha L^{1-\alpha})(1-\alpha)\alpha R^{2\alpha-1}L^{1-2\alpha}-U'(R^\alpha L^{1-\alpha})(1-\alpha)\alpha R^{\alpha-1}L^{-\alpha} + (1-\alpha)\alpha R^{\alpha-1}L^{-\alpha}[U'(R^\alpha L^{1-\alpha}) - U'(R^\alpha L^{1-\alpha} + W)] < 0.$

These conditions hold for sufficiently large W and concave $p(e)$.

Result ii:

We can also see that higher c causes an increase in $\frac{\partial e}{\partial R}$:

Specifically, $\frac{\partial}{\partial c}(\frac{\partial e}{\partial R}) = (1-\alpha)\alpha R^{\alpha-1}L^{-\alpha}[U'(R^\alpha L^{1-\alpha}) - U'(R^\alpha L^{1-\alpha} + W)] > 0.$

A.2   Corruption Mechanism:

Recall that the opportunistic politician's maximization problem with the corruption mechanism is:

$U = p(\alpha)U(\alpha f(R) + W) + (1 - p(\alpha))U(\alpha f(R))$

Differentiating this with respect to α gives his optimal choice for α :

$FOC : p'(\alpha^*)U(\alpha^* f(R) + W) + (p(\alpha^*) + c)U'(\alpha^* f(R) + W)f(R) - p'(\alpha^*)U(\alpha^* f(R)) + (1 - p(\alpha^*) - c)U'(\alpha^* f(R))f(R) = 0$

Differentiating the FOC with respect to R gives $\frac{\partial \alpha}{\partial R} : \frac{\text{Numerator}}{\text{Denominator}}$

Numerator=

$-\{p'(\alpha)\alpha f'(R)[U'(\alpha f(R)+W)-U'(\alpha f(R))]+(p(\alpha)+c)\alpha f'(R)f(R)[U''(\alpha f(R)+W)-U''(\alpha f(R))]+(p(\alpha) + c)f'(R)[U'(\alpha f(R) + W) - U'(\alpha f(R))] + U'(\alpha f(R))f'(R) + \alpha f'(R)f(R)U''(\alpha f(R))\}$

Denominator=

$p''(\alpha)U(\alpha f(R)+W)+p'(\alpha)U'(\alpha f(R)+W)f(R)+p'(\alpha)U'(\alpha f(R)+W)f(R)+(p(\alpha)+c)U''(\alpha f(R)+W)f(R)^2-p''(\alpha)U(\alpha f(R))-p'(\alpha)U'(\alpha f(R))f(R)-p'(\alpha)U'(\alpha f(R))f(R)+(1-p(\alpha)-c)U''(\alpha f(R))f(R)^2 = SOC < 0$

The denominator is just the second order condition, and is always < 0. Therefore the sign of $\frac{\partial \alpha}{\partial R}$ depends on the sign of the numerator, and we can focus on the numerator alone in the following.
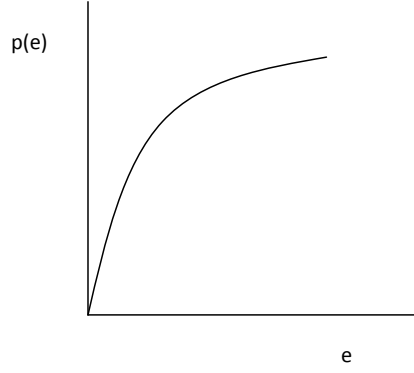
Figure 1: Probability of re-election given effort e

Assume $U''(\alpha f(R) + W) - U''(\alpha f(R)) \approx 0$ which is true if $U''' = 0$ (no precautionary motive).

Result i:

We can see that:

i) When c is negative enough such that $p(\alpha) + c = 0$ (in the limit), $\frac{\partial \alpha}{\partial R} > 0$ if

$$p'(\alpha)\alpha f'(R)[U'(\alpha f(R) + W) - U'(\alpha f(R))] + U''(\alpha f(R))f(R)\alpha f'(R) + U'(\alpha f(R))f'(R) > 0$$

ii) When c is positive enough such that $p(e) + c = 1$, $\frac{\partial \alpha}{\partial R} < 0$ if

$$p'(\alpha)\alpha f'(R)[U'(\alpha f(R) + W) - U'(\alpha f(R))] + U''(\alpha f(R))f(R)\alpha f'(R) + f'(R)[U'(\alpha f(R) + W) - U'(\alpha f(R))] + U'(\alpha f(R))f'(R) < 0$$

These conditions are true for sufficiently large W and convex $p(\alpha)$.

Result ii:

We can also see that higher c causes a decrease in $\frac{\partial \alpha}{\partial R}$:

Specifically, $\frac{\partial}{\partial c}(\frac{\partial \alpha}{\partial R}) = f'(R)[U'(\alpha f(R) + W) - U'(\alpha f(R))] < 0$.

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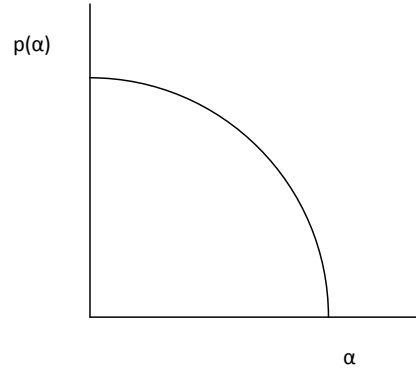
Figure 2: Probability of re-election given corruption α

B   Tables

Table 1: Change in Politician Behavior with Rainfall

	Incumbency Advantage	Incumbency Disadvantage
$\frac{\partial Corruption}{\partial Rain}$	< 0	> 0
$\frac{\partial Effort}{\partial Rain}$	> 0	< 0

Table 2: Pakistan's Incumbency Disadvantage

	Probability of Election in t+1	
	Quartic Polynomial[a]	Spline[b]
Incumbent	-0.133***	-0.157**
	(0.047)	(0.071)
# Observations	4048	4048
R-sq	0.25	0.26

OLS regressions with constituency and year fixed effects.

Probability of election in the next time period regressed on indicator for whether the candidate is an incumbent.

[a] Quartic polynomial specification with a quartic in the vote margin.

[b] Spline specification with knots at vote margin levels -45, -35, -25, -15, -5, 0, 5, 10, 15, 25, 35, and 45.

Robust standard errors clustered by province in parentheses.

* denotes significance at 10%, ** at 5%, and *** at 1%.

Table 3: India Incumbency Effects by Year

Election Year	Incumbency Effects	
1980	12.57	(12.75)
1984	5.93	(11.46)
1989	9.75	(7.47)
1991	-19.64	(12.09)
1996	-3.92	(5.07)
1998	-7.43	(11.27)
1999	-16.71	(14.12)

Source: Linden (2004), Table 6.

OLS regressions with constituency and year fixed effects.

Probability of election in the next time period regressed on indicator for whether the candidate is an incumbent,

in a spline specification with knots at vote margin levels -45, -35, -25, -15, -5, 0, 5, 10, 15, 25, 35, and 45.

Standard errors clustered by state in parenthesis.

* denotes significance at 10%, ** at 5%, and *** at 1%.

Table 4: India Incumbency Effects by Party

	Incumbency Effects by Party	
	Pre-1991	Post-1991
Congress	19.49*	-17.18**
	(10.35)	(8.12)
Non-Congress	-0.75	-9.56
	(6.72)	(7.64)

Source: Linden (2004), Table 9.

OLS regressions with constituency and year fixed effects.

Probability of election in the next time period regressed on indicator for whether the candidate is an incumbent,

in a spline specification with knots at vote margin levels -45, -35, -25, -15, -5, 0, 5, 10, 15, 25, 35, and 45.

Incumbency effects are separated out by party affiliation of candidates (Congress Party and non-Congress).

Standard errors clustered by state in parenthesis.

* denotes significance at 10%, ** at 5%, and *** at 1%.

Table 5: India Re-election on Rainfall

	Party Re-elect			
	Pre-1991		Post-1991	
Ratio (Duration Rain)	0.4870***		-0.1710*	
	(0.1004)		(0.1030)	
Ratio (Prior Year Rain)		0.2384***		-0.2106***
		(0.0877)		(0.0794)
R-sq	0.51	0.51	0.33	0.33
Obs	1503	1503	2004	2004

OLS regressions with constituency and year fixed effects.

Party re-elect is an indicator for whether the incumbent's political party is re-elected.

Ratio (Duration Rain) is average annual rainfall in the constituency for the duration the incumbent was in power, divided by mean annual rainfall in the constituency.

Ratio (Prior Year Rain) is rainfall in the constituency in the last twelve months that the incumbent was in power, divided by mean annual rainfall in the constituency.

Robust standard errors clustered by longitude-latitude grid point in parentheses.

* denotes significance at 10%, ** at 5%, and *** at 1%.

Table 6: India Re-election: Rainfall Effects by Year

| Election Year | Party Re-elect | |
	Ratio Prior Year Rain	Ratio Duration Rain
1980	0.3398***	0.1432
	(0.1173)	(0.1415)
1984	0.2447**	0.9256***
	(0.1058)	(0.1777)
1989	0.1604	-0.1469
	(0.1305)	(0.1595)
1991	-0.5083***	-0.5863***
	(0.1143)	(0.1519)
1996	-0.1075	-0.4090**
	(0.1177)	(0.1732)
1998	-0.0519	-0.0355
	(0.1091)	(0.1014)
1999	-0.2234*	-0.2399*
	(0.1345)	(0.1446)
R-sq	0.25	0.26
Obs	3507	3507

OLS regressions with constituency and year fixed effects.

Party re-elect is an indicator for whether the incumbent's political party is re-elected.

Ratio (Duration Rain) is average annual rainfall in the constituency for the duration the incumbent was in power, divided by mean annual rainfall in the constituency.

Ratio (Prior Year Rain) is rainfall in the constituency in the last twelve months that the incumbent was in power, divided by mean annual rainfall in the constituency.

Robust standard errors clustered by longitude-latitude grid point in parentheses.

* denotes significance at 10%, ** at 5%, and *** at 1%.

Table 7: Pakistan Re-election on Rainfall

	Party Re-elect			
	Column 1[1]	Column 2[2]	Column 3[3]	Column 4[4]
Ratio (Duration Rain)	-0.2038**	-0.3082**		
	(0.0961)	(0.1349)		
Ratio (Prior Year Rain)			-0.2041**	-0.4091**
			(0.0847)	(0.2023)
Rain*Urban		0.0033		0.0053
		(0.0025)		(0.0035)
R-sq	0.55	0.53	0.54	0.53
Obs	621	585	621	585

OLS regressions with constituency and year fixed effects.

Party re-elect is an indicator for whether the incumbent's political party is re-elected.

Ratio (Duration Rain) is average annual rainfall in the constituency for the duration the incumbent was in power, divided by mean annual rainfall in the constituency.

Ratio (Prior Year Rain) is rainfall in the constituency in the last twelve months that the incumbent was in power, divided by mean annual rainfall in the constituency.

[2,4]Urban denotes the proportion of the population living in urban areas in the district in 1998.

[2,4]Urban is a constituency-specific variable and is therefore not directly included in the regression, because there are constituency fixed effects.

[1,3]Robust standard errors clustered by longitude-latitude grid point in parentheses.

[2,4]Robust standard errors clustered by district in parentheses.

* denotes significance at 10%, ** at 5%, and *** at 1%.

Table 8: India Rainfall Effects by Party

	Party re-elect			
	Pre-1991	Post-1991	Pre-1991	Post-1991
Ratio (Duration Rain)			-0.004	-0.202*
			(0.144)	(-0.119)
Ratio (Prior Year Rain)	-0.095	-0.342**		
	(0.107)	(0.088)		
Congress Incumbent	-0.200	-0.508**	-0.074	-0.096
	(0.133)	(0.139)	(0.237)	(0.171)
Rain x Congress Incumbent	0.673**	0.454**	0.472*	0.061
	(0.129)	(0.131)	(0.213)	(0.154)
R-sq	0.62	0.34	0.60	0.33
Obs	1503	2004	1503	2004

OLS regressions with constituency and year fixed effects.

Party re-elect is an indicator for whether the incumbent's political party is re-elected.

Ratio (Duration Rain) is average annual rainfall in the constituency for the duration the incumbent was in power, divided by mean annual rainfall in the constituency.

Ratio (Prior Year Rain) is rainfall in the constituency in the last twelve months that the incumbent was in power, divided by mean annual rainfall in the constituency.

Congress incumbent is an indicator for whether the incumbent belongs to the Indian National Congress Party.

Robust standard errors clustered by longitude-latitude grid point in parentheses.

* denotes significance at 10%, ** at 5%, and *** at 1%.

Table 9: Weather Effect? Election Day Rain

	Log (Voter Turnout)	
	India	Pakistan
Election Month Rainfall	-0.00	-0.023
	(0.00)	(0.016)
R-sq	0.83	0.75
Obs	3507	616

OLS regressions with constituency and year fixed effects.

Election month rainfall is a proxy for rainfall on the election day.

Robust standard errors clustered by longitude-latitude grid point in parentheses.

* denotes significance at 10%, ** at 5%, and *** at 1%.

Table 10: Pakistan Assembly Dissolution Rain

	Party re-elect
Ratio (Dismissal Rain)	-0.015
	(0.065)
R-sq	0.54
Obs	621

OLS regressions with constituency and year fixed effects.

Party re-elect is an indicator for whether the incumbent's political party is re-elected.

Ratio(Dismissal Rain) is rainfall in the three months in which the Assembly was dissolved, divided by mean rainfall in those three months.

Robust standard errors clustered by longitude-latitude grid point in parentheses.

* denotes significance at 10%, ** at 5%, and *** at 1%.

Table 11: Pakistan Development Fund Spending Summary Statistics

	Total Funds Spent by MNAs (million Rs)				
Budget Year	# Obs	Mean	Min	Max	Non-0
1988-89	207	6.42	0	14.56	201
1989-90	207	6.39	0	14.56	201
1991-92	207	11.14	0	14.51	203
1992-93	207	8.23	0	15.45	174
1993-94	207	5.52	0	15.78	135
1994-95	207	6.67	0	24.65	206
1995-96	207	8.97	1.25	21	207
1996-97	207	1.71	0	10	96
1998-99	207	4.84	0	9	138
1999-00	207	0.26	0	9	7

Table 12: Development Spending Results

	Development Fund Spending (in millions)
Ratio (Prior Year Rain)	-6.0559***
	(1.1635)
R-sq	0.61
Obs	621

OLS regressions with constituency and year fixed effects.

Development Fund Spending is total funds spent by each MNA in his constituency in the year corresponding to the rainfall measure.

Ratio (Prior Year Rain) is rainfall in the constituency in the last twelve months that the incumbent was in power, divided by mean annual rainfall in the constituency.

Robust standard errors clustered by longitude-latitude grid point in parentheses.

* denotes significance at 10%, ** at 5%, and *** at 1%.

Table 13: Agriculturist Results

	Party re-elect	
Ratio (Prior Year Rain)	0.135	
	(0.114)	
Ratio (Duration Rain)		0.287*
		(0.151)
Only Agriculturist	0.493*	0.260
	(0.282)	(0.272)
Rain x Only Agriculturist	-0.443*	-0.181
	(0.274)	(0.235)
R-sq	0.45	0.45
Obs	1503	1503

OLS regressions with constituency and year fixed effects.

Party re-elect is an indicator for whether the incumbent's political party is re-elected.

Ratio (Duration Rain) is average annual rainfall in the constituency for the duration the incumbent was in power, divided by mean annual rainfall in the constituency.

Ratio (Prior Year Rain) is rainfall in the constituency in the last twelve months that the incumbent was in power, divided by mean annual rainfall in the constituency.

Only Agriculturist is an indicator for whether the politician's only other occupation is agriculture.

Robust standard errors clustered by longitude-latitude grid point in parentheses.

* denotes significance at 10%, ** at 5%, and *** at 1%.

C Tables Appendix

Table A1: India Re-election Summary Statistics

	India Re-election Means	
Election Year	Party	Candidate
1980	0.29	0.19
1984	0.64	0.29
1989	0.37	0.22
1991	0.59	0.42
1996	0.49	0.27
1998	0.50	0.39
1999	0.50	0.43
Obs	504	503

Table A2: Pakistan Re-election Summary Statistics

	Pakistan Re-election Means	
Election Year	Party	Candidate
1990	0.45	0.38
1993	0.48	0.34
1997	0.47	0.31
Obs	207	207

Table A3: India Candidate Re-election on Rainfall

	Candidate Re-elect			
	Pre-1991		Post-1991	
Ratio (Duration Rain)	0.0014		-0.1277	
	(0.1050)		(0.0954)	
Ratio (Prior Year Rain)		0.1832**		-0.1598**
		(0.0862)		(0.0759)
R-sq	0.39	0.39	0.36	0.36
Obs	1500	1500	2000	2000

OLS regressions with constituency and year fixed effects.

Candidate re-elect is an indicator for whether the incumbent candidate is re-elected.

Ratio (Duration Rain) is average annual rainfall in the constituency for the duration the incumbent was in power, divided by mean annual rainfall in the constituency.

Ratio (Prior Year Rain) is rainfall in the constituency in the last twelve months that the incumbent was in power, divided by mean annual rainfall in the constituency.

Robust standard errors clustered by longitude-latitude grid point in parentheses.

* denotes significance at 10%, ** at 5%, and *** at 1%.

Table A4: India Candidate Re-election: Rainfall Effects by Year

	Candidate Re-elect	
Election Year	Ratio Prior Year Rain	Ratio Duration Rain
1980	0.0245	-0.0727
	(0.0854)	(0.1563)
1984	0.1412	0.2362
	(0.1109)	(0.1897)
1989	0.2806**	0.0230
	(0.1135)	(0.1274)
1991	-0.3472***	-0.3605**
	(0.1060)	(0.1527)
1996	-0.0600	-0.3158**
	(0.0946)	(0.1328)
1998	0.0360	-0.0723
	(0.1029)	(0.0984)
1999	-0.1725***	-0.0836
	(0.1433)	(0.1556)
R-sq	0.24	0.24
Obs	3500	3500

OLS regressions with constituency and year fixed effects.

Candidate re-elect is an indicator for whether the incumbent candidate is re-elected.

Ratio (Duration Rain) is average annual rainfall in the constituency for the duration the incumbent was in power, divided by mean annual rainfall in the constituency.

Ratio (Prior Year Rain) is rainfall in the constituency in the last twelve months that the incumbent was in power, divided by mean annual rainfall in the constituency.

Robust standard errors clustered by longitude-latitude grid point in parentheses.

* denotes significance at 10%, ** at 5%, and *** at 1%.

Table A5: Pakistan Candidate Re-election on Rainfall

	Candidate Re-elect	
Ratio (Duration Rain)	-0.0079	
	(0.0847)	
Ratio (Prior Year Rain)		-0.0044
		(0.1085)
R-sq	0.44	0.44
Obs	617	617

OLS regressions with constituency and year fixed effects.

Candidate re-elect is an indicator for whether the incumbent candidate is re-elected.

Ratio (Duration Rain) is average annual rainfall in the constituency for the duration the incumbent was in power, divided by mean annual rainfall in the constituency.

Ratio (Prior Year Rain) is rainfall in the constituency in the last twelve months that the incumbent was in power, divided by mean annual rainfall in the constituency.

Robust standard errors clustered by longitude-latitude grid point in parentheses.

* denotes significance at 10%, ** at 5%, and *** at 1%.

Table A6: Agriculturist Results for Candidate Re-election

	Candidate re-elect	
Ratio (Prior Year Rain)	0.044	
	(0.103)	
Ratio (Duration Rain)		0.078
		(0.146)
Only Agriculturist	0.203	0.154
	(0.243)	(0.225)
Rain x Only Agriculturist	-0.213	-0.145
	(0.238)	(0.198)
R-sq	0.46	0.46
Obs	1500	1500

OLS regressions with constituency and year fixed effects.

Candidate re-elect is an indicator for whether the incumbent candidate is re-elected.

Ratio (Duration Rain) is average annual rainfall in the constituency for the duration the incumbent was in power, divided by mean annual rainfall in the constituency.

Ratio (Prior Year Rain) is rainfall in the constituency in the last twelve months that the incumbent was in power, divided by mean annual rainfall in the constituency.

Only Agriculturist is an indicator for whether the politician's only other occupation is agriculture.

Robust standard errors clustered by longitude-latitude grid point in parentheses.

* denotes significance at 10%, ** at 5%, and *** at 1%.