

STOCKHOLM SCHOOL OF ECONOMICS
Department of Economics
5350 Master's thesis in economics
Spring 2014

Rain, Income Shocks and Voter Turnout: Evidence from India

Rickard Lunnerdal (40426)

Abstract: Exogenous rainfall variation is exploited to capture arguably causal effects of income shocks on voter turnout in Indian state assembly elections over the period 1959-1990. Using rainfall to measure income variation is motivated by rain-fed agriculture being the main income source for a majority of the rural Indian population. During years with below-average rainfall, harvests are smaller than usual, resulting in negative income shocks. In IV specifications where total output and agricultural output are instrumented with rainfall variation, negative rain-induced shocks to output of 10 percent result in 2.2 and 1.4 percentage point decreases in voter turnout respectively. Similarly, in reduced-form OLS specifications, a standard deviation less rainfall results in approximately a 1 percentage point decrease in voter turnout. Results have potentially large implications for democratic accountability and drought relief spending, as government incentives to respond to shocks are lower if voter turnout among the affected has decreased. Suggestive evidence however shows that turnout levels have a significantly positive effect on incumbent election performance and that decreases in turnout are smaller if government relief spending has been high, creating incentives for incumbents to encourage high voter turnout, which can partly be achieved by responding forcefully to rain-induced income shocks.

Keywords: voter turnout, income shocks, rainfall, India, political economy

JEL-codes: D-72, O-13, P-16

Supervisor: Anders Olofsgård
Date submitted: May 14, 2014
Date examined: May 26, 2014
Discussant: Alexander Schlomberg
Examiner: Erik Meyersson

Acknowledgements

I am grateful to my thesis supervisor Anders Olofsgård for valuable support, discussions and comments throughout the process of finalizing the thesis. I also wish to thank Sebastian Axbard for reading drafts and generously providing helpful comments and suggestions. Finally, the Economic Organization and Public Policy Programme (EOPP) of the London School of Economics deserves a special mention for sharing their data online. All remaining errors are my own.

Contents

- 1. Introduction..... 4
- 2. Theoretical Framework 7
 - 2.1 A Simple Model of Voter Turnout 7
 - 2.2 Adding Clientelism to the Model..... 9
- 3. Previous Empirical Research..... 10
 - 3.1 Determinants of Voter Turnout..... 10
 - 3.2 The Effects of Income Shocks 11
 - 3.3 Income Shocks and Voter Turnout 12
- 4. Hypothesis 14
 - 4.1 Potential Effects of an Income Shock on Turnout 15
 - 4.2 A Testable Hypothesis 17
- 5. Indian Democracy 17
 - 5.1 Characteristics 18
 - 5.2 The Indian Voter 18
- 6. Data and Descriptive Statistics 20
- 7. Identification Strategy 25
- 8. Results 28
- 9. Implications of Results..... 38
- 10. Conclusion 42
- 11. References..... 45

- Appendix I..... 50
- Appendix II..... 51
- Appendix III..... 53

1. Introduction

The importance of democratic accountability and political participation for public goods provisioning and distributive policy has been stressed by many scholars of political economy (see e.g. Schumpeter, 1942, Przeworski *et al.* 1999; Sen and Drèze, 1989; Lijphart, 1997). A central mechanism of democratic accountability is the right of citizens to elect their government through popular elections. If participation in elections is low, the possibility of holding government accountable decreases and the incentives for politicians to implement distributive policies are reduced as a consequence. In terms of representation, groups or regions in which voter turnout is low risk receiving less public goods from the government, as the cost for politicians of neglecting parts of the electorate that do not vote is low (e.g. Griffin and Newman, 2005; Martin, 2003; Strömberg, 2004; Horiuchi and Saito, 2009).

One of the occasions where citizens in developing countries most urgently need government support through distributive policy is arguably when a negative economic shock (e.g. a drought) has occurred. A large body of research has shown the vulnerability of the poor and uninsured to such shocks (see e.g. Banjee and Duflo, 2011; Morduch, 1994). Following the above argument, voter turnout among the affected is likely to be an important factor in determining how forcefully governments respond to income shocks with relief to poor citizens. This has been confirmed by research on the topic (Besley and Burgess, 2002), but previous literature has treated turnout as an exogenous factor, failing to account for if voter turnout is affected by the shock itself. If citizens affected by income shocks react by abstaining in democratic elections, the incentives for democratic governments to respond to shocks decrease, while the opposite is true if income shocks result in an increase in voter turnout. This creates a need to understand why people choose to vote, and more specifically a need to understand how voter turnout is affected by income shocks.

The purpose of this thesis addresses that need by empirically testing how income shocks affecting the rural poor impact voter turnout in a total of 110 Indian state assembly elections. Exogenous rainfall variation across a panel of 15 major Indian states over the years 1959-1990 is exploited to capture income fluctuations of poor rural farmers. The main source of income for a large portion of the population in India is rain-fed agriculture. During years with low levels of rainfall, harvests of rain dependent crops become smaller, consequently reducing the income of farmers. Using rainfall variation to capture exogenous shocks to income allows for identification of arguably causal effects by eliminating endogeneity bias that a specification testing direct effects of an income variable on voter turnout is likely to suffer from.

The fact that India is the largest democracy in the world, harboring numerous ethnicities, religions and languages, in itself merits careful study of the country. Several additional factors make India an ideal setting for the current analysis. India is a reasonably well functioning democracy, allowing to study voter turnout in a relevant context. Simultaneously, India has a very large poor rural population that is dependent on rain-fed agriculture, making it possible to exploit rainfall variation to capture the effects of income shocks. Moreover, data availability on India is impressively good for being a developing country. Combined, these factors provide uniquely favorable conditions for the purpose of the thesis.

Results show that rain-induced income shocks have a significant effect on voter turnout among the rural poor in India. More specifically, negative income shocks decrease voter turnout, while positive shocks to income have the opposite effect. Using an instrumental variable (IV) approach with normalized rainfall as an instrument for income, negative rain-induced income shocks decreasing total per capita output and agricultural per capita output by 10 percent, reduce voter turnout by 2.2 and 1.4 percentage points respectively. When reduced-form model specifications are used instead, one standard deviation less rainfall than average results in approximately 1 percentage point lower voter turnout. However, when a constructed drought dummy variable is used as an instrument and independent variable in a reduced-form model respectively, no significant effects on voter turnout are found, even though coefficient signs are consistent with previous results. Similarly, changes in rainfall from the previous year do not have a significant effect on voter turnout, but coefficient signs are in accordance with previous results. Lack of significance when using the drought variable might be explained by a low number of drought observations in the data and by lost variation when creating a binary dummy variable. Alternatively, lack of significance could also be an indication that the effect of income shocks on turnout is less pronounced during more extreme weather events.

Based on the theoretical framework used to identify determinants of voter turnout, negative rain-induced income shocks leading to decreases voter turnout could be a result of 1) the shock changing perceptions about the ability and priorities of politicians, reducing the difference in utility between different candidates gaining office, 2) the shock leading to a withdrawal effect among voters caused by increased opportunity costs and lower capacity to participate in politics, 3) the shock lowering expressive utility derived from supporting the democratic system or a certain candidate by voting and 4) the shock decreasing resources political parties have available to spend on vote buying and patronage, lowering the utility of voting for those that otherwise would have sold their votes.

Results have potentially serious implications. If voter turnout, as previous research has shown, indeed has a positive effect on government relief spending, the fact that voter turnout seems to

decrease as a consequence of negative rain-induced income shocks suggests that incentives for state governments in India to respond forcefully to negative shocks are reduced. In cases they do not exist, a possible policy response to address this problem is to create specific calamity relief funds that are released automatically if, for instance, rainfall has been below a certain threshold level. This would reduce the risk of weak responses by governments due to lower voter turnout caused by negative income shocks. Additional indicative evidence however shows that there might be other factors at play that could at least partly counter the negative effects decreased voter turnout can have on the willingness of politicians to implement strong policy responses to negative income shocks. First, reported suggestive evidence indicates that voter turnout has a significantly positive effect on incumbent electoral performance, which implies that income shocks can alter election outcomes not only by active voters changing preferences, but also through a voter turnout channel. Second, further indicative results show government relief spending has a significantly positive effect on voter turnout. Combined, these two pieces of evidence indicate that incumbents have an interest in maintaining high turnout levels and that this can partly be achieved by increasing relief spending.

The thesis adds to the current state of knowledge in at least four dimensions. First, it contributes to the surprisingly scarce and currently inconclusive empirical literature on how income shocks affect voter turnout by, to my knowledge, being the first study to explore the effects of income shocks on voter turnout in a developing country context. This is important as it is plausible that voters' reactions to income shocks vary with a country's level of development. Second, an identification strategy that more convincingly than previous research allows to argue causality is employed by exploiting exogenous variation in rainfall to capture income fluctuations. Third, insights on the context specific characteristics of political participation and behavior among the rural poor in India are gained by looking at how they react to rain-induced income shocks. Fourth, the thesis adds to a rich literature on how weather-related income shocks impact the lives of poor people by specifically looking at how exogenous rainfall shocks affect political participation through voting.

The remainder of the thesis is organized as follows. Section two introduces a simple theoretical framework of voter turnout that will be used in the forthcoming analysis and section three reviews previous research on voter turnout and income shocks. Section four then builds on earlier sections by discussing through which mechanisms income shocks can affect voter turnout in India and by formulating a testable hypothesis. This is followed by section five that briefly introduces the main features of Indian democracy and section six that describes the data used in the empirical analysis. Section seven outlines an identification strategy for the empirical analysis followed by section eight that presents the results, section nine that discusses consequences and implications of results and section ten that concludes the thesis.

2. Theoretical Framework

The purpose of this section is to present a simple model of voter turnout that will be used as a framework in the coming analysis. The aim is that the framework will make it easier to later on (in section four) organize thoughts around the channels through which income shocks can affect voter turnout.

2.1 A Simple Model of Voter Turnout

Anthony Downs (1957) was the first to apply economic utility maximization theory to study why citizens choose to vote in democratic elections. Assuming that individuals are economically rational, they should only vote if the instrumental benefit from voting is larger than the cost associated with the activity. A very simple framework that has become the workhorse model in instrumental voting theory is here used to illustrate Down's reasoning:

$$R_i = P_i B_i - C_i$$

where for individual i , R is the expected utility of voting, P is the perceived probability that the vote of individual i changes the outcome of the election, B is the relative benefit if the preferred candidate of i wins compared to if the opponent wins and C is the cost of voting. For an individual to be willing to vote, R has to be positive, i.e. the expected pay-off from voting must be larger than the cost.

The fundamental problem of the model and of instrumental voting theory more broadly is that it cannot explain the relatively high levels of voter turnout observed in democratic elections. For an individual to gain instrumental utility from voting, he must be directly able to affect the outcome of the election. The probability (P) of that happening decreases with the size of the electorate, approaching zero as the number of people voting increases. Since the number of voters in a democracy is usually large (which is certainly true in the case of India), the instrumental pay-off from casting a vote quickly becomes indistinguishable from zero¹. Even if costs of voting that include transportation to the polling station, opportunity costs of time lost when voting and costs associated with becoming informed about which candidate to vote for are low, they are almost certain to be higher than the benefit from voting. Clearly, the model cannot explain the relatively high voter turnout observed in democracies. This irregularity has been dubbed the "turnout paradox" (Dhillon and Peralta, 2002).

¹ The model was for simplicity created for an election with two candidates only. Even though the probability of impacting the outcome with one single vote becomes larger in a proportional system with multiple candidates (like India's), it will in large electorates remain small enough to stay indistinguishably close to zero.

The failure of instrumental voting theory to explain high turnout is a version of what Mancur Olson (1965) first called the collective action problem. Economic theory predicts that in the production of public goods, individuals will face strong incentives to free-ride. It is better to let others exert effort and then reap the benefits of non-excludable goods. Because of the free-riding problem, many activities that would be beneficial for the group as a whole will fail to be pursued. In democratic elections, individuals will face incentives to abstain from voting as their individual instrumental impact on the outcome is minimal and they prefer others to incur the cost associated with voting.

Many theoretical attempts to solve the turnout paradox have been presented. Downs himself suggested that it could be rational to vote in order to support the democratic system if one expects few others to vote. Individuals that value democracy the most will therefore vote to maintain the system, which would otherwise fall apart. Consequently, Downs moves away from strictly instrumental reasons for voting and argues that individuals may also incur intrinsic value from voting. The idea that the act of voting might have a value in itself, rather than being a means to reach other benefits, has later been pursued by many others (e.g. Riker and Ordeshook, 1968; Brennan and Hamlin, 1998). These explanations to why individuals participate in democratic elections can be categorized as *expressive* reasons to vote and can in turn be divided into two groups: First, an individual can gain utility by expressing support for the democratic system and by using the right to participate in elections through the act of voting. Second, expressive utility can be derived through satisfaction gained from supporting (or punishing) a candidate that one likes (or dislikes), even though the vote will not be instrumental for the outcome of the election. In the first case, expressive value is derived from participating in the election, while in the second case it originates from voting for a particular candidate. To include expressive voting, an additional term (D) was added to the model by Riker and Ordeshook (1968):

$$R_i = P_i B_i - C_i + D_i$$

Although most scholars agree an expressive element is necessary to explain turnout, the main problem with the D-term is that it is exogenously determined, making it a “black box” variable picking up whatever the other variables cannot². In addition, it also makes the explanation for voting unrelated to the actual purpose of elections, which is to choose a government (Geys, 2006a). Probably the most elaborate attempt to endogenize expressive voting has been made by Schuessler (2000). He argues that an important reason to vote is the utility gained from being able to associate oneself with an outcome or candidate. The value of association is then made dependent on both *how many* and *who* votes for this outcome. One of the results is that the model can explain bandwagon

² The D-term can also be used to incorporate explanations for voter turnout in other research fields, including psychology and anthropology, as these explanations mostly focus on forms of intrinsic utility from voting.

effects where a certain candidate quickly picks up momentum and increases the number of supporters as the utility from being associated with the candidate increases. This could partly explain the success of regional Indian parties that quickly gain large followings (how many) based on class, caste, ethnicity or religion (who). When the following of a candidate in the model passes a certain threshold, the utility of association starts to decrease as there is limited expressive value if everyone else is also voting for the candidate.

Besides intrinsic value generated from expressive voting, others have attempted alternative theoretical approaches to explain election turnout motivated by utility maximization and rational choice. These include game theoretic, bounded rationality, group based and information based approaches. These theories will not be described in detail here, as they do not add any crucial component relevant for how income shocks impact election turnout, which is the topic of this thesis. Geys (2006a) and Dhillon and Peralta (2002) both provide comprehensive reviews of the literature and conclude that none of the rational choice approaches manage to explain high voter turnout in a convincing manner.

2.2 Adding Clientelism to the Model

As will be shown in section five, clientelism through vote buying and patronage are salient features in Indian democracy. Attempting to pin down what clientelism is, Dunning *et al.* (2013) contrast clientelism from other forms of distributive politics by assigning two distinct characteristics to it. First, clientelism is a form of non-programmatic distribution, meaning that there is no public criteria for how distribution occurs or that the existing criteria are not followed. Second, the receipt of benefits from distribution has to be contingent on the individual's political support (vote) in a *quid pro quo* exchange. If these two criteria are met, the activity is defined as clientelism. When the practice is directed at voters it is labelled as vote buying, while it is called patronage when directed at party members. To account for such democratic imperfections and alternative motivations to vote, I add an additional term (M) to the model:

$$R_i = P_i B_i - C_i + D_i + M_i$$

Like B, this is an instrumental benefit from voting, but it is independent of the probability (P) of changing the outcome of the election. Rather, it is a direct payment from participating in the election, making instrumental motivations for voting a possibility. This benefit can come as a direct payment for voting or as a reward distributed by the candidate if he wins the election. Hence, the term M consists of two distinctive parameters:

$$M_i = \pi K_i + H_i$$

where π is the probability that the candidate individual i has voted for wins the election³, K is the payoff i receives if that candidate wins the election and H is the payoff i receives from voting, independently of who wins the election.

3. Previous Empirical Research

In this section empirical research on what determines voter turnout, the consequences of income shocks and how income shocks specifically affect voter turnout is briefly reviewed. Previous research can provide guidance on what effect to expect income shocks to have on voter turnout. Empirical research that specifically looks at conditions in India will be discussed in section five and is therefore not included here.

3.1 Determinants of Voter Turnout

In addition to theoretical attempts to explain voter turnout, empirical research can also provide some insights on the matter. The empirical literature on voter turnout is vast and analyses a large number of variables that can affect turnout, which is why the goal in this section is limited to providing a brief overview, summarizing four established factors that appear to have an impact on turnout. Since most of the research in the field studies developed and established democracies, it is not certain that all results hold in developing country democracies.

First, a prominent and well established empirical observation in the literature on developed democracies is the robust relation between socioeconomic status (SES) and political participation. In most democracies, individuals with high income and education are more likely to be involved in politics and in regions with low average SES, aggregate political participation tends be lower (e.g. Dalton, 2006; Pintor and Gratschew, 2002). This includes the activity to vote in elections (e.g. Blais *et al.*, 2000). In his summary of the literature, Dalton (2006) concludes that social status is the most important individual characteristic determining political participation. Further research on the topic has found that enhanced access to resources as time, money, information, knowledge and skills is what mainly makes SES an important determinant of political participation (Verba *et al.*, 1995). It has also been found that education is the single most important social status factor determining political participation (Nie *et al.*, 1996). Although more research is needed, the strong relationship between SES and political participation widely observed across developed democracies does not seem to hold in poor democracies in Africa (Bratton, 2008) and Latin America (Booth and Seligson, 2008). Neither does it hold for India, as will be shown in section 5. In these countries individuals and regions with low SES levels appear to vote as least as much as others.

³ Note that this parameter is distinctively different from the term P in the sense that it measures the probability of a certain candidate winning the election. It does *not* measure the probability of a single individual vote changing the outcome of the election.

Second, other individual characteristics than SES, such as age and gender, matter for voter turnout. It is established in the literature that old citizens are more likely to vote than young ones (Dalton, 2006). Hence, in regions or countries with a large young population, aggregate voter turnout tends to be lower. When it comes to gender, men used to be more likely to vote than women, but this difference appears to have disappeared in developed democracies in recent years, mainly because of progress in gender equality, providing women with resources and rights necessary to vote (e.g. Inglehart and Norris, 2003). The difference is however likely to persist in many developing countries, meaning that poor countries and regions, with a smaller proportion of women in the population, e.g. due to “missing women” in many Asian countries (Sen, 1990; Klasen and Wink, 2003), are more likely to experience high aggregate turnout levels.

Third, institutional factors and the political system appear to have an important role in explaining differences in turnout between countries. One such factor is proportional versus majoritarian representation, where turnout tends to be higher in proportional systems because even a smaller vote share for a particular candidate will lead to some representation, while the winner takes all in a majoritarian system, making it less worthwhile to go vote for a candidate that is unlikely to win the election (P in the model is higher) (Pintor and Gratschew, 2002). Other important factors are whether or not citizens have to register in advance to be eligible to vote and how often citizens are expected to vote, as too many voting occasions can lead to “voter fatigue” (Dalton, 2006).

Fourth, a common observation in the empirical literature is that the closeness of an election (Franklin, 2004) and policy differences between candidates (Blais, 2006; Geys, 2006b) have a significant positive impact on turnout. These findings are consistent with rational choice theory, as close elections will increase the probability of directly impacting the outcome with a single vote (P in the model) and differences between candidates will increase the relative utility from an individual’s preferred candidate winning (B in the model).

3.2 The Effects of Income Shocks

Having identified the main determinants of voter turnout we now take a brief look at the research on the effects of income shocks, the main independent variable of interest. An income shock is here broadly defined as an unexpected change in income levels that can be either positive or negative. Income shocks can occur both on the individual and aggregate societal level. For instance, if an individual loses his or her job, an income shock hits a particular person or household, but does not affect income levels of the population as a whole. If total economy-wide unemployment levels increase, this on the other hand results in an aggregate income shock for the entire group that has lost their job and might have wider economic and political consequences on the national level. Due to the data and empirical identification strategy employed in this thesis, the main interest is with

aggregate income shocks affecting a larger group (in this case poor rural farmers dependent on rainfall for income). Moreover, as the analysis looks at a relatively poor country as India, the main interest is on the effects income shocks have in developing countries.

One important observation is that in developing countries the poor are often highly vulnerable to negative income shocks, as they are usually uninsured, governments do not provide public safety nets and availability of credits to smooth out consumption is low (Banerjee and Duflo, 2011; Morduch, 1994). Moreover, as Banerjee and Duflo (2011) point out, shocks reducing income with the same proportion are likely to affect the poor more severely than the wealthy, as the poor are forced to cut down on essential goods, often including food, and shocks can throw affected poor households into more permanent poverty traps. Due to this fact, it is particularly important to understand the effects of income shocks in poor countries, as shocks in these places have large consequences both at the individual and societal levels. One strand of empirical literature that addresses this need uses rainfall to capture income variation among poor rural farmers. Findings show that rain-induced shocks to income affect everything from civil conflict (Miguel *et al.*, 2004), ethnic riots (Bohlken and Sergenti, 2010) and witch killings (Miguel, 2005) to democratization (Brückner and Ciccone, 2011), girls' schooling (Björkman-Nyqvist, 2013) and remittances (Arezki *et al.*, 2011). This thesis adds to the literature by examining the effects of rain-induced income shocks on voter turnout in India.

Another vast literature on income shocks, related to the topic of this thesis, is the one on “economic voting”. Economic voting is a term originating from the empirical observation that in bad economic times (i.e. during negative income shocks) incumbents in most democracies face a clear disadvantage, while if the economy is doing well the probability of incumbents being re-elected increases significantly. This is consistent with numerous media reports citing that an upcoming election will be about the “state of the economy”. Most research on the topic is on developed democracies, but from the research that exist, the relationship seems to hold in developing countries as well (e.g. Roberts, 2008; Carlin and Singer, 2013). Instead of looking at how economic performance and income variation over time impact incumbent chances of re-election, this thesis looks at how changes in income affect participation in elections.

3.3 Income Shocks and Voter Turnout

Having introduced the literature on voter turnout and income shocks, the research covering how these two variables relate to each other is now presented. There is surprisingly little research on how income shocks impact turnout in democratic elections and most of it is relatively dated. The lack of previous research is especially surprising considering the vast literature on economic voting that explores *who* citizens vote for, but not *whether* they vote in times of economic hardship. As Burden

and Wichowsky (2012) point out, turnout might explain some of the incumbent disadvantage in bad economic times, as the phenomenon of economic voting could partly be due to changes in who votes, rather than only a choice between candidates by active voters. Moreover, practically all of the existing empirical literature on income shocks and election turnout deals with US data. To my knowledge this is the first paper to study the issue in a developing country context.

The empirical evidence on how income shocks impact voter turnout is mixed. Early work on the topic predominantly finds that in times of economic hardship, either turnout decreases or no effect is found. The seminal study of Rosenstone (1982) uses US presidential and mid-term election data. He finds that increased aggregate short-term unemployment and a decline in financial well-being decreases turnout. Several studies have found similar results (Kinder and Kiewiet, 1981; Hansen and Rosenstone, 1993; Southwell, 1988) and Schur (2003) finds the same relationship using a broader measure of political participation. This conclusion has been the most common one: economic hardship leads to lower turnout. However, there are also studies that find no relationship between economic adversity and voter turnout (Arcelus and Meltzer, 1975; Fiorina, 1978).

A few recent papers using more sophisticated data and econometric techniques have questioned these findings. Among them Charles and Stevens (2013) use US county level panel data over several decades to estimate various instrumental variable and OLS models. They find that decreases in wages and employment increase turnout in all elections except presidential ones, where no effect is found. Similarly, Burden and Wichowsky (2012) use US panel data on state, county and individual levels, include a large number of control variables and estimate several OLS and difference-in-difference models. They find that higher unemployment leads to higher voter turnout and that the difference in turnout between the employed and unemployed decreases as state unemployment increases. However, a recent paper by Loose and Jae (2011) finds negative income shocks decrease turnout by employing a similar approach to the one in this thesis. They use exogenous variation in temperature to show that exposure to unusually cold winters that increase the cost of living, decreases turnout among low-income voters in the US. In spite of these econometric improvements, endogeneity concerns remain salient in the previous literature, making the current approach, using exogenous variation in rainfall to measure income, an important contribution to attempts to identify causality. As of today, the jury is still out and no research consensus currently exists on how the relationship between economic performance and turnout looks. Neither is it clear that a developing country like India experiences the same effects from an income shock as a developed country like the US does.

Although the research on income shocks and voter turnout has predominantly been driven by empirical work, scholars have made some attempts to theoretically motivate their results. None of

these motivations are presented through unified formal theory and mostly seem to be created in an *ad hoc* manner. The theories look at how income shocks affect voter turnout at the individual level, but when income shocks affect a large number of people (like shocks caused by low rainfall or a general increase in total unemployment) these individual effects can translate into aggregate changes in voter turnout. First, those finding a negative effect on turnout mainly argue that the downturn leads to a withdrawal effect caused by lowering the capacity to participate and by increasing the opportunity cost of voting (mainly C in the model above). For instance, Rosenstone (1982) argues this point, explaining it by the fact that individuals experiencing a negative income shock tend to become preoccupied with personal financial matters and have to spend all resources finding a new job or holding on to their current one. This effect is also in accordance with recent work in behavioral economics by Mullainathan and Shafir (2013) that argue scarcity changes peoples' behavior and creates a kind of tunnel vision where what is scarce (in this case money) draws away attention from everything else (including voting).

Second, researchers that find a positive effect on turnout on the contrary identify a mobilization effect caused by an increased vigilance and enhanced tendency among voters to hold government responsible for its actions when hit by negative shocks to income (Burden and Wichowsky, 2012). This is partly due to asymmetrically strong reactions to negative economic changes and higher voter responsiveness to bad news. It is argued that these factors will increase turnout by mobilizing voters that have been negatively affected by the shock and who see voting as a way of punishing the incumbent or possibly as an action that might improve the overall economic climate.

Third, neutral effects of income shocks on turnout are mainly explained by the possibility of the mobilization and withdrawal effects taking each other out on the aggregate level (Arcelus and Meltzer, 1975). On the individual level, an income shock could make a certain category of voters motivated to vote while causing others to withdraw. Although this does not lead to an effect on aggregate turnout levels, it would change which individuals or groups choose to vote or abstain, potentially impacting aggregate election outcomes and which individuals in society influence politics. A final possibility is that income shocks simply have no effect on voter turnout.

4. Hypothesis

As the section on previous research has shown, there is no consensus on how income shocks affect voter turnout in democratic elections and no study has previously attempted to shed light on this issue in a developing country context. Therefore, it is difficult to make *ex ante* predictions on how income shocks are expected to impact turnout in the Indian case. In short, there could be a positive, a negative or a neutral effect. To move beyond the mobilization and withdrawal effects, theory and

previous research presented above is used to clarify the potential effects an income shock could have on turnout in the Indian case, followed by the identification of a testable hypothesis.

4.1 Potential Effects of an Income Shock on Turnout

To show how an income shock can impact voter turnout, it is useful to think in terms of the slightly modified instrumental voting model introduced in section two:

$$R_i = P_i B_i - C_i + D_i + M_i$$

The effect of an income shock, s , on the expected utility of voting will depend on the sum of effects that s has on parameters P , B , C , D and M respectively. Hence, the change in expected utility of voting depends on the accumulated change in 1) the relative benefit if the preferred candidate of i wins compared to if the opponent wins, multiplied by the perceived probability that the vote of individual i changes the outcome of the election, 2) the cost of voting, 3) the expressive utility from voting and 4) the instrumental benefit of clientelism from voting. To identify how an income shock is expected to affect turnout, the effect of a shock on each of these factors has to be analyzed.

Starting with the effects a negative income shock caused by scarce rainfall can have on B in the model (perceived difference in utility between ones preferred candidate winning compared to if the opponent wins), the potential effect on turnout hinges on if the shock itself changes voter preferences and on how the incumbent responds to the shock. As changes in rainfall are exogenous shocks that politicians have no power over, instrumental voters should not judge the ability of politicians to govern on the occurrence of such shocks. However, the shock can potentially change voter preferences over which policy issues or politician characteristics that are most important, which changes how candidates are valued and thus might alter the size of B . Moreover, how the incumbent reacts to a rainfall shock can signal ability and willingness to exert effort, also alternating how voters value candidates. If changed preferences due to the shock and the incumbent response to the shock reduces the difference in perceived utility gained from ones favorite candidate winning (B decreases) the utility of turning out to vote also decreases, while the opposite is true if the response to the shock increases the value of B . Hence, the effect of a rainfall shock on B is unclear, as the effect a shock has on preferences is not necessarily the same across voters and even if it were, the initial value of B also differs among individuals. Similarly, even if a strong shock response by the incumbent has the same effect across individuals on the valuation of the competence of the incumbent (which is not necessarily the case), the effect on B remains unclear as the initial difference in utility between alternative candidates taking office differs among individuals. It should be noted that if voters are assumed to be rational, the effect of a shock on B will have a minimal effect on

turnout as the probability (P) of changing the outcome of the election remains negligible. An income shock is not expected to alter the value of P .

Moving on to the effect of a negative rainfall shock on C (the cost of voting) the most probable effect is that the opportunity cost of voting increases due to larger time constraints, which in turn has a negative effect on voter turnout. This is in accordance with the withdrawal effect introduced above, where potential voters experiencing an income shock become preoccupied with finding ways to make ends meet, increasing the opportunity cost of voting. In the case of a poor Indian farmer, he or she might find it necessary to search for alternative sources of income during years with bad harvests to feed the family and keep children in school. The extra time spent finding other sources of income, which is pursued in addition to regular agricultural work, can increase the opportunity cost of voting. This is supported by Kochar (1995) that shows poor farmers in India often use alternative employment to smooth out consumption in years with bad harvests and by Mullainathan and Shafir (2013) that show scarcity often results in less attention to other issues (like voting). Although less likely, the opposite effect, where the opportunity cost of voting decreases due to an income shock, is also a possibility. This can occur if a rainfall shock destroys part of the crop, decreasing the agricultural workload of farmers, while farmers simultaneously become disillusioned, giving up attempts to find alternative income sources or if such income sources simply are unavailable. In such a case, an income shock would leave farmers with more leisure time, decreasing the opportunity cost of voting and thus potentially increasing turnout.

The effects of a negative income shock caused by scarce rainfall on D (expressive utility from voting) is perhaps the most difficult to pin down. An income shock can lead to increased turnout, as individuals hit by the shock can gain expressive utility from punishing an incumbent (by voting for another candidate) that is blamed for the shock or for inability to respond to the shock. Similarly, an income shock can decrease voter turnout as potential voters that are unhappy with the reaction of the incumbent to the shock might decide it is not worthwhile to vote at all. The former effect is in accordance with the mobilization effect introduced above. This effect induces changes in expressive utility from voting for a certain candidate or party, but there is also a potential effect on the expressive utility of participating in the election to support the democratic system. A negative income shock might cause a sense of alienation and disappointment in the ability of democracy to improve conditions or function efficiently. A consequence of this disappointment can be that utility gained from voting to express support for the democratic system decreases, resulting in a negative effect on turnout. However, expressive utility from participating could also increase due to a negative income shock, as it might become more rewarding to make the sacrifice of voting to support the democratic system when times are difficult and the system might be questioned or threatened.

Finally, a negative income shock can also have an effect on M (instrumental utility from clientelism). One plausible effect is that rural farmers that experience a negative income shock become more willing to accept a direct reward for voting, as they are in greater need of increasing their immediate income. If this is the case, turnout would increase in response to a negative income shock, as voters are more likely to trade their vote, and thus also become more likely to show up to vote. However, this effect could be countered by a reduced ability for parties to engage in vote buying, as a rainfall shock might decrease the revenue of political parties, consequently limiting their possibility to use vote buying as a strategy to win elections.

4.2 A Testable Hypothesis

On balance, it becomes difficult to theoretically predict how a negative rainfall shock will affect voter turnout, as there are multiple alterations to incentives that simultaneously move in opposite directions. As has been shown in the literature review, empirical evidence does not provide much guidance either. Hence, it is difficult to conclude more than that a positive effect on turnout can be expected if factors that predict an increase in turnout dominate, while the opposite is true if factors negatively impacting turnout dominate. Additionally, the effect could also be neutral if positive and negative factors take each other out or if income shocks simply do not have any effect of importance on turnout. With these ambiguous predictions from theory and previous research, the formulation of a hypothesis is driven by making it as easily testable as possible. Consequently, it is presented as a null hypothesis, commonly formulated as a default outcome that no significant effect different from zero is found, i.e. that income shocks have no significant effect on turnout:

Null hypothesis 1: *Income shocks caused by exogenous rainfall variation that affect the rural poor have no significant impact on voter turnout in Indian state assembly elections*

A failure to reject the null will indicate that income shocks have no significant effect on turnout in Indian state assembly elections. A rejection of the null hypothesis on the other hand suggests that income shocks do have a significant effect on turnout. While a positive coefficient means negative income shocks decrease voter turnout (more rain, more voting), a negative coefficient means negative income shocks increase turnout (more rain, less voting)⁴.

5. Indian Democracy

This section briefly introduces basic facts and history about democracy in India, as well as reviews some of the existing research on turnout and voter behavior in India. The aim is to provide a context for the coming empirical analysis that is conducted using data from India.

⁴ Conversely, a positive coefficient means positive income shocks increase turnout and a negative coefficient means positive income shocks decrease turnout.

5.1 Characteristics

After independence in 1947, India established what today is the world's largest democracy. With a population of more than 1.2 billion (World Bank, 2012), over 700 million registered voters and over 400 million that actually voted in the 2009 parliamentary elections (IDEAS, 2011), organizing a national election in India is a massive project. When independence was gained, many observers predicted that democracy in India would not survive for long (Mitra and Enskat, 1999). The size of the country and its great diversity with numerous ethnicities, religions and languages combined with a long colonial history meant prospects were bleak. Nonetheless, democracy is still around and today has widespread support among the Indian population (Krishna, 2008).

In 1950 a modern constitution was adopted, proclaiming India as a "sovereign, federal, democratic republic", setting the ground rules for the democratic system. India has a bicameral parliamentary system with a lower (the Lok Sabha) and an upper house (the Rajya Sabha). Although the central government has significant powers, the 28 states have influence over many issues. State assemblies also consist of an upper and lower house headed by a chief minister that forms a state government. National as well as state elections are commonly held every five years. India has a proportional election system, often resulting in a relatively large number of parties represented in parliaments and making coalition governments common. (Sharma, 2003) During the time after independence the National Congress Party has dominated political life. The party has held office during most of this time, but in recent decades it has faced increasing competition from the Hindu nationalist BJP on the national level. The BJP remains an important contestant together with a large number of regional parties predominantly based on ethnicity, religion, class or caste that have increasingly gained influence and created a highly competitive political environment. (Chandra *et al.*, 2008)

Despite of the impressive resilience and merits of Indian democracy, it also has many imperfections. Perhaps the most important one is the failure of the government to provide basic public services and improve the lives of the poor in India. Poverty and inequality remain widespread, despite years of promises by politicians to address these issues. A part of this failure is due to endemic corruption in the Indian government and public sector that causes inefficiency and reduces growth levels. (see e.g. Sen and Drèze, 1996; Mehta, 2003; Parry, 2000)

5.2 The Indian Voter

A strength of Indian democracy is that voter turnout is relatively high. On average, turnout in national and state elections has been around 60 % (IDEAS, 2011), which is higher than in several western democracies. Another important feature is that the poor and uneducated in India vote at least as often as the rich and educated (Yadav, 1999; Mitra and Singh, 1999). The fact that poor rural Indians vote in such large numbers is somewhat difficult to explain when considering that poor

Indians can expect very little from the government in terms of public goods delivery, in general are unhappy with the performance of the state and often have to travel far as well as spend hours in line to be allowed to cast their ballot (Mitra and Enskat, 1999).

Qualitative research suggests a plausible explanation to high voter turnout is that poor Indians to a large extent vote for right based expressive reasons (D in the model). Ahuja and Chhibber (2012) have conducted interviews finding that the main motivations for poor Indians to vote is that they see the act of voting as an expression of their right as citizens and that voting is one of the few occasions where they have the right to express their opinion towards the state. Indians with more economic resources on the contrary tend to answer that they vote because they expect material benefits or access to the state if the desired candidate wins. Similarly, Banjeree (2007) has studied poor Indians on Election Day and found that it is common to regard voting as a ritual or ceremony performed to express the right of citizenship and support for democracy. In such explanations for turnout among the poor, the act of voting exclusively has intrinsic value. Voters do not expect anything in return from the government and do not believe their vote will have a real impact on their well-being. It is also established through survey research that poor Indians place high value in democracy and democratic institutions (Krishna, 2008), which could increase intrinsic value from voting.

Other explanations for high election turnout among the poor in India and other developing country democracies mainly relate to clientelism through vote buying and patronage (M in the model) (e.g. Dunning *et al.*, 2013). The main explanation is that poor and illiterate citizens are more likely to trade their votes for handouts or other direct benefits. This is mainly due to lower costs for candidates to buy a vote from poor citizens, as they are likely to have a lower reservation price. Hence, voters do not cast their ballots because they expect the quality of governance will change or because they could impact the outcome in accordance with their preferences. Rather, they see their vote as a good that can be exchanged for a direct instrumental benefit. Due to its nature, it is hard to put a number on how widespread clientelism and vote buying is in India, but case study (Dunning *et al.*, 2013; Cole, 2009; Chandra, 2004) and anecdotal (The Hindu, 2011; The Economist, 2014) evidence is plenty.

Besides surprisingly high voter turnout, especially among the poor, a few additional observations relevant for the topic of this thesis can be made about voter behavior in India. One such observation is that there is a large incumbent disadvantage in elections in India. Uppal (2008) uses a regression discontinuity design and finds that in state legislative elections incumbents face a significant disadvantage that has increased in recent decades. He also finds that the disadvantage is larger in states with high poverty and unemployment as well as with low public goods provisioning. This suggests that although dissatisfaction with government performance among the poor does not seem

to result in low voter turnout, it is clearly manifested in a tendency to use votes to express dissatisfaction by not voting for politicians that currently hold office.

This is confirmed in papers closely related to this thesis where Cole *et al.* (2012) and Bubb (2008) use rainfall variation in India to measure income shocks and find that incumbents are punished in state elections when rainfall has been scarce and rural income consequently has decreased. This supports the notion that voters do use their vote to express dissatisfaction. However, Cole *et al.* (2012) also find that when state governments have responded strongly with drought relief programs, the incumbent disadvantage somewhat decreases, implying that government responses to droughts have an effect on the possibility of incumbents to get re-elected. This thesis complements the work of Cole *et al.* and Bubb by focusing on whether the turnout pattern changes as a consequence of income shocks, rather than on which candidate those that decide to participate vote for.

In a similar vein, Besley and Burgess (2002) develop a model they confirm empirically with Indian data, where governments become more responsive to negative weather shocks if voter turnout and newspaper circulation is high. If turnout and media presence is high, accountability increases as information about policy is more easily available and this knowledge is more likely to become a threat to the incumbent if many vote. Hence, not only who those that cast a ballot vote for matters, but also how many that turn out to vote. Besley and Burgess treat voter turnout as exogenously determined, while this thesis investigates if weather shocks themselves have an effect on turnout, which potentially also has implications for government responsiveness.

6. Data and Descriptive Statistics

Data is obtained from the *Economic Organisation and Public Policy Programme* (EOPP) of the London School of Economics that has compiled several datasets on Indian state level variables. Employing this data, a panel dataset on 15 major Indian states during the period 1959-1990 is constructed⁵. The panel is unbalanced due to some missing values. Although the data is obtained from the EOPP, variables originate from a range of different sources. The data is briefly described in this section and appendix I provides more detailed information on sources and how variables are constructed. Summary statistics of the main variables are presented in Table 1 by state. A notable observation is that the main variables of interest (turnout, rainfall and output) vary considerably between states, which allows for meaningful analysis. Similarly, graphs in appendix II show that there is substantial variation in turnout, rainfall and output within states over time.

⁵ The main variables of interest (rainfall and turnout) were first used in a paper by Besley and Burgess (2002) that look at the impact of the media and voter turnout on government responsiveness to droughts and floods.

Table 1: Descriptive Statistics

State	Turnout	Elections	Rainfall	Std. Rainfall	Drought	Output/Capita	Ag. Output Share	Rural Pop. Share	Literacy
	(%)	(no.)	(mm)	(mm)	(no.)	'000 rupees	(%)	(%)	(%)
Andhra Pradesh	69.3	7	150.9	36.5	3	26.2	45.1	77.4	33.1
Assam	63.5	7	425.5	81.4	3	25.8	44.9	90.3	40.3
Bihar	53.9	8	258.4	43.9	1	14.1	46.9	88.6	28.5
Gujarat	56.7	6	166.6	58.3	4	36.2	34.5	68.8	43.3
Jammu & Kashmir	65.4	5	107.6	38.2	5	21.3	45.3	78.9	28.2
Karnataka	64.7	7	357.2	65.7	1	27.7	44.4	72.2	43.1
Kerala	76.1	9	446.9	109.7	1	26.2	40.2	79.9	71.4
Madhya Pradesh	51.4	7	258.2	45.9	2	21.1	46.8	80.5	33.5
Maharashtra	62.1	7	310.4	58.3	3	42.8	26.0	65.1	50.3
Orissa	49.7	8	274.7	38.7	1	19.1	49.2	89.3	33.5
Punjab	60.4	7	179.1	50.2	4	53.3	50.3	72.8	46.3
Rajasthan	54.9	7	113.2	30.2	1	22.7	50.6	79.9	28.2
Tamil Nadu	67.9	8	79.0	14.6	2	29.0	30.6	67.1	50.4
Uttar Pradesh	53.0	9	235.9	44.9	1	19.3	50.0	83.1	29.9
West Bengal	69.9	8	414.2	58.1	3	27.4	34.6	73.9	44.5
Total	61.3	110	252.8	128.8	35	27.3	42.5	77.9	40.2

Notes: Data covers the years 1959-1990. Turnout is the share of eligible voters that cast a ballot in state assembly elections. Elections is the number of state assembly elections held during the time period. Rainfall is monthly average rainfall during the period in millimeters. Std. Rainfall is the standard deviation of monthly average rainfall in millimeters. Drought is the number of years with rainfall more than one standard deviation below average. Output/Capita is total output per capita in thousands of rupees. Ag. Output Share is the share of total output that is from the agricultural sector. Rural Pop. Share is the share of total population that lives in rural areas. Literacy is the share of population over seven years old that is literate.

The dependent variable, turnout, measures the share of population by state eligible to vote that actually turn out to cast a ballot⁶ in state assembly elections (Vidhan Sabha) commonly held every five years. Column two in Table 1 shows there has been a total of 110 state assembly elections during the investigated period. In the data, the level of turnout is held constant during years between elections and is coded to in regression analysis capture the impact of rainfall in period t , on turnout in the next upcoming election. Total average turnout is 61.7 % and varies from 53 % in Uttar Pradesh to 76.1 % in Kerala. Although Indian election data is generally reliable and the election committee in India is widely known for its independence and ability to organize fair elections, it is impossible to completely eliminate concerns of potential measurement error. When it comes to turnout data in general, examples of problems that could arise are manipulation of election results or that election rolls are not updated, containing names of citizens that are dead or have migrated, which inflates the denominator in the ratio of participating voters to the total number of eligible voters. Although these concerns should be treated seriously, there is no reason to believe that measurement error in this case is large or systematic.

The rainfall variable captures monthly average state level rainfall in millimeters during years 1959-1990. Table 1 shows total average monthly rainfall is 252.8 mm, but varies from an average of 79 mm in Tamil Nadu to 446.9 mm in Kerala. To make rainfall comparable across states and years, a normalized rainfall variable is constructed and used in the baseline regression models. Its construction follows Cole *et al.* (2012) that use a similar empirical approach to this thesis and is defined as $\frac{rain_{st} - \overline{rain}_s}{sdrain_s}$, where $rain_{st}$ is monthly average rain by state and year, \overline{rain}_s is average rainfall by state over the period 1959-1990 and $sdrain_s$ is the average standard deviation of rainfall by state over the period 1959-1990. With this definition, average state rainfall is normalized to zero and observations that differ from the mean are measured as standard deviations from normal state rainfall.

Two alternative measures of rainfall are used in additional specifications. First, a dummy variable is constructed to capture drought years, where years with more than one standard deviation below average rainfall are coded as drought years. This allows to control if years with extremely low rainfall have a different effect on turnout than years with more normal rainfall variation. As Table 1 shows, there is a total of 35 drought observations in the data. A weakness with such a drought dummy variable to keep in mind is that the cut-off point for defining a drought year by construction is somewhat arbitrary. It might also be the case that a certain deviation from normal rainfall in one state implies a serious drought destroying yields almost completely, while in another might only

⁶ Both valid and invalid votes are counted.

mean a minor change in harvest size. Second, a variable that captures change in rainfall compared to the previous year is used. This variable captures the importance of variation in income between years, rather than deviations in rainfall levels from the mean.

One potential problem with using rainfall data on state level is that it might fail to capture large variation in rainfall within states. Different areas of the same state could potentially experience different amounts of rainfall and the impact of these differences on turnout will not be captured with state level data. Nonetheless, average state rainfall should provide a good enough picture of rainfall levels and as Table 1 and appendix II have shown, the rainfall data exhibits substantial variation both between states and within states over time. Moreover, state level rainfall has successfully been used before to capture income in India (Bohlken and Sergenti, 2010). As always, an issue that could cause problems is measurement error. The rainfall data used here is gathered from a number of weather stations in each state, which is then compiled into an average state rainfall variable. One source of measurement error could come from varying ability of measuring rainfall correctly across states due to e.g. different income levels or state size (as a larger state would require more weather stations to get precise results). However, this should not be of great concern as fixed effects specifications used rely on within state variation, implying this is only a problem if the ability to measure rainfall changes within states over time. In addition, this type of measurement error is unlikely to be systematic in the sense that some states (or time periods) always under- or over-report rainfall levels. Finally, it should be noted that one potential problem with relying on variation in absolute rainfall levels to capture effects on income, is that not only how much it has rained, but also *when* the monsoon season starts matter for harvest size and consequently income. Failing to incorporate this element into the analysis might weaken the link between rainfall and output in the sample, but absolute rainfall levels should still capture enough of the effect of rain on harvests (and consequently on income levels) for meaningful analysis to be conducted.

To establish the link between rainfall and income that is necessary to justify the usage of rainfall as a measure for income shocks, a variable that captures income is needed. As the main interest in this thesis is how rain-induced income shocks affect individuals' decision to vote, it would be ideal to use yearly household level income data to capture changes in income. As this type of data is unavailable, a more aggregated income variable has to be used. For this purpose aggregated state output and aggregated state agricultural output are available. In forthcoming regressions output variables are divided by population size to reflect per capita values. These variables are imperfect measures of rural household income, as even though a large majority of Indians rely on rain-fed agriculture, only a small portion of total aggregated income comes from this sector. As Table 1 shows, an average of 77.9 % of the population in the sample live in rural areas (of which a large majority has agriculture as

the main source of income), while agriculture only accounts for 42.5 % of total output. Even if agricultural output is instead used to measure income, a substantial part is likely to originate from larger scale irrigated farming⁷.

In addition to the main variables of interest, a number of control variables that can have an effect on voter turnout are included⁸. First, two variables capturing election characteristics - political competition and political fragmentation - are included⁹. According to the literature review of Geys (2006b) these are common measures included in empirical work studying voter turnout. The measure of political competition follows Besley and Burgess (2002) that use the same election data as employed here and is measured as minus the absolute difference between the proportion of seats held by the Congress party¹⁰ and the proportion held by the main competing group of parties¹¹. A smaller difference between main opponents in terms of occupied seats is interpreted as a higher level of political competition. Controlling for political competition is necessary, as closeness of elections have proven to be an important determinant of voter turnout. Political fragmentation is measured as the number of candidates per seat in states assemblies. A high number of candidates per seat implies high political fragmentation. This is the most common approach to capture political fragmentation in the previous literature (Geys, 2006b). High political fragmentation can increase turnout as it becomes more likely that voters find a candidate they identify with and high political competition can lead to better policy outcomes, but a negative effect on turnout can also arise as fragmented political systems to a larger extent must seek coalitions, which reduces the direct impact of voters on who actually governs (Geys, 2006b).

Second, as was pointed out in section three, aggregate SES-variables like education, wealth and income are potentially important factors for the level of voter turnout. Therefore literacy and the share of the population that does not own land are controlled for. Income levels are not included as controls in models, as variation in income is expected to be the main channel through which rainfall affects voter turnout. The land ownership variable is included to capture an element of wealth levels, as a large portion owning an asset like land is likely to imply higher average household wealth and lower inequality.

⁷ Unfortunately I do not have access to data on the prevalence of irrigated farming at the state level.

⁸ A number of additional variables that affect voter turnout could be identified and it is impossible to control for all relevant factors. The choice of variables included here is based on a combination of the importance they are given in previous research and on data availability.

⁹ There is a certain possibility that these variables are affected by income shocks and thus a part of the channel through which income shocks can affect voter turnout, making them what Angrist and Pischke (2009) call “bad controls”. Although this cannot be ruled out, there is no straightforward reason to believe this is happening, which is why it is determined that the value of including these variables is larger than of omitting them.

¹⁰ The Congress party was the dominating political force in India during the time period of interest.

¹¹ Which the main competing parties are differ among states and over time.

Third, population density is included as an additional control that is expected to capture a part of the cost of voting. The rationale here is that the lower the population density is, the further away the polling station is likely to be located, increasing the time it takes to vote and the transport costs associated with voting.

7. Identification Strategy

The fundamental relationship of interest expressed in the hypothesis is how changes in income among the rural poor affects voter turnout in democratic state assembly elections held in India. A basic and straight-forward econometric model to capture this relationship looks as follows:

$$turnout_{st} = \alpha_t + \delta_s + \beta_1 output_{st} + \beta_2 X_{st} + \varepsilon_{st} \quad (1)$$

where *turnout* measures state assembly voter turnout in state *s* and year *t*, α captures year-specific effects, δ captures state-specific effects, *output* is the logarithm of aggregate per capita output, X is a vector of control variables and ε is the error term. Standard errors are clustered at the state level (15 clusters¹²) in all specifications. Assuming estimates are unbiased, a β_1 that is significantly different from zero allows to reject the null hypothesis. Although controlling for factors that remain constant over time across states by exploiting panel properties of the data and including control variables in the specification, it remains probable that the above model suffers from endogeneity. More specifically, there could be unobservable time-variant variables in the error term that can have an effect on both income and turnout, resulting in omitted variable bias. Another possibility is that turnout levels affect income levels leading to reversed causality issues. A possible channel this could happen through is if turnout levels have an impact on policy choices (either through an accountability mechanism or by altering election outcomes), which in turn affects economic growth. Yet another weakness of this approach is that it captures general changes in income across the entire population rather than how shocks to income affect the behavior of the rural poor specifically, which is what the thesis aims at investigating.

To deal with endogeneity bias and to more convincingly argue causality, exogenous variation in rainfall is exploited to measure income. The rationale behind this strategy is that the main income source for a majority of the Indian population living in rural areas is rain-fed agriculture and Indian farmers thus heavily depend on the unpredictable monsoon that accounts for 70-95 percent of yearly

¹² A low number of clusters can sometimes lead to slightly underestimated standard errors, but this should not be seriously biasing results here.

rainfall¹³ (FAO, 2014). During years with below-average rainfall, harvests are smaller than usual and income consequently lower. Both irrigated farming and urbanization has been increasing in recent decades, but considering that the data used here spans the period 1959-1990 this should not be of great concern for the analysis. In the current data set 77.9 percent of the total population lives in rural areas and according to Droogers *et al.* (2001) 70 percent of agriculture in India was rain-fed in the year 2000; a number that is likely to have been considerably higher during the current period of interest (1959-1990). Severe droughts can cause serious damage to rural households in India, historically resulting in occasional famines (Sen and Drèze, 1989), but even smaller negative rainfall deviations can cause substantial income losses. The exploitation of rainfall to exogenously capture income variation has become popular and is widely used in a broad set of countries and regions where a large part of the population has rain-fed agriculture as their main source of income (e.g. Miguel *et al.* 2004; Brückner and Ciccone, 2011; Arezki *et al.*, 2011), including in India (see e.g. Cole *et al.*, 2012; Bubb, 2008; Bohlken and Sergenti, 2010; Shah and Steinberg, 2012).

A necessary condition for the use of rainfall variation as a useful variable to measure income shocks, is that income indeed is impacted by rainfall through an effect on harvest size and household income. Ideally, yearly income variation would be measured on the rural household level, but as such data is unavailable, either total aggregate output or aggregate agricultural output on state level can be used. The relation between rainfall and output variables is tested in the following regression model:

$$output_{st} = \alpha_t + \delta_s + \beta_1 rain_{st} + \beta_2 rainsq_{st} + \beta_3 X_{st} + \varepsilon_{st} \quad (2)$$

where *output* is the logarithm of total or agricultural per capita output in state *s* and year *t*, α captures year-specific effects, δ captures state-specific effects, *rain* is normalized rainfall, *rainsq* is normalized rainfall squared to allow for nonlinear functional forms, *X* is a vector of control variables and ε is the error term. The inclusion of a squared rainfall variable is motivated by the fact that it is likely that there is diminishing marginal returns to rainfall, creating a concave relationship between rainfall and yields, as *too much* rain is likely to damage crops.

The specification in equation (2) corresponds to the first-stage regression of an instrumental variable (IV) two-stage-least-square (2SLS) approach where rainfall is used as an instrument for income. The second stage looks like equation (1) presented above, with the crucial difference that the output variable is instrumented by exogenous variation in rainfall. Both rainfall and output variables are also lagged one period to account for the fact that most rain falls during the monsoon period in June-

¹³ The data used includes rainfall over the whole year rather than only during the monsoon season which is the period that mostly is important for harvest size. Although this might slightly reduce precision, the rainfall outside of the monsoon period is only a small portion of total rainfall and this should therefore not be of great concern for results.

September¹⁴, whereas elections are commonly held during February-May (Cole *et al.*, 2012). Thus, it is predominantly the rainfall of the previous year that will affect income levels at the time of elections. This IV-approach is the preferred method used here to measure the effect of income shocks on turnout by exploiting rainfall variation, as it allows to isolate the variation in income that is due to rainfall and test how that variation affects voter turnout. In other words it, if unbiased, estimates the Local Average Treatment Effect (LATE) of those affected by rainfall shocks (poor rural farmers dependent on rainfall for income) on voter turnout. The main identifying assumption is that lagged rainfall is exogenously determined in the equation, i.e. that rainfall is uncorrelated to the error term, ε , and that the dependent variable, turnout, does not have an effect on rainfall. Moreover, it is required that the instrument (rainfall) is correlated to the endogenous variable (per capita output). In the current case two main concerns could lead to biased IV-estimates.

First, there is a possibility that the rainfall instrument is not strong enough (i.e. that the correlation between the instrument and the endogenous variable is weak), due to the fact that that aggregate output variables (the endogenous variables instrumented for) depend on many other factors than rainfall variation. Even though a large proportion of Indian households are dependent on rain-fed agriculture, this source of income only accounts for a limited part of aggregate output variables used as independent variables in the current specifications. This might make the relation between rain and output variables relatively small, leading to rainfall becoming a weak instrument for aggregate total output and aggregate agricultural output. Weak instruments are undesired as they bias IV results towards OLS estimates (Bound *et al.* 1995). The strength of instruments will be tested by presenting results from first-stage regressions using equation (2) above.

Second, there is a possibility that rainfall could affect turnout through other channels than income, violating the exclusion restriction that the instrument is uncorrelated with the error term. Probably the most likely channel this might happen through, is that in years with above average rainfall roads could become damaged or disease burden could increase, making the cost (C) of reaching the ballot box, and consequently of voting, higher. Although this possibility should be kept in mind when interpreting IV results, these and other factors increasing voting costs due to abundant rain should be reduced by the fact that elections in India are usually held in the beginning of the year, whereas rain mostly falls during the monsoon period in June-September. Hence, the probability that damage caused by the monsoon remains a hindrance to voting in elections held at least six months later is

¹⁴ I do not have access to monthly rainfall data to directly test this, but it is established that the majority of Indian rainfall comes during the monsoon period and that this rain in most cases is the one that matters for harvest sizes (FAO, 2014)

small. In spite of this, it would be useful to control for changes in infrastructure and disease burden due to rainfall variation, but unfortunately such data on the state level has not been available.

Due to some uncertainty about the strength of first-stage regressions and the possibility of rainfall affecting voter turnout through other channels than income, the reduced-form relationship between rainfall variation and voter turnout is also presented. Using a reduced-form equation, where rainfall acts as a proxy for income, is a common approach in the literature (see e.g. Bubb, 2008; Björkman-Nyqvist, 2013; Shah and Steinberg, 2012). Provided IV estimates are unbiased, reduced-form results should be proportional to the causal effect of interest in second-stage IV regression (Angrist and Pischke, 2009). A similar relation between rainfall and turnout as between per capita output and turnout thus increases the credibility of IV-results as it shows that rainfall has a direct effect on turnout. Moreover, reduced-form results are interesting in their own right, as they capture the effects of a *rainfall* shock (as opposed to an *income* shock) without risking biased results. As the bulk of variation in turnout caused by changes in rainfall are likely due to the effect rainfall has on income, rainfall works as a useful proxy for income. The baseline equation used to estimate the reduced-form effect of income shocks on voter turnout looks as follows:

$$turnout_{st} = \alpha_t + \delta_s + \beta_1 rain_{st-1} + \beta_2 rainsq_{st-1} + \beta_3 X_{st} + \varepsilon_{st} \quad (3)$$

where *turnout* measures state assembly voter turnout in state *s* and year *t*, α captures year-specific effects, δ captures state-specific effects, *rain* is normalized rainfall lagged one period, *rainsq* is lagged normalized rainfall squared to allow for nonlinear functional forms, *X* is a vector of control variables and ε is the error term. As previously mentioned, alternative specifications and definitions of the explanatory variable are employed as robustness checks. Lagged normalized rainfall will also be interacted with rural population share as an additional test. If rainfall affects voter turnout through an income channel, effects on turnout is expected to be larger in areas where a large portion of the population lives in rural areas and have agriculture as their main source of income.

8. Results

The main empirical results are outlined in this section. It begins by presenting results from basic OLS specifications where total per capita output and agricultural per capita output are used as the main independent variables of interest. As these models are likely to suffer from endogeneity, rainfall is instead introduced as a source of income variation. First, it is tested if rainfall affects aggregate output variables. This is a necessary step to ensure that rainfall indeed can have an effect on voter turnout through an income variation link. This is followed by the main analysis where the effect of agricultural output on voter turnout is tested using rainfall as an instrument for total per capita output and agricultural per capital output. Moreover, results from reduced-form models where the

direct effects of rainfall on turnout are tested are also reported as well as results from specifications using alternative definitions of the rainfall variable. All specifications with control variables have been run with rural population share as a control instead of population density, but this does not significantly change results. Standard errors are clustered on state level across specifications to allow for correlated standard errors within states, but not across states.

Results from a basic OLS specification using the logarithm of output per capita variables as independent variables are presented in Table 2. Output variables have a significantly positive effect on voter turnout across specifications. With state and year fixed effects, but without control variables, coefficient magnitudes suggest an increase in total and agricultural per capita output of 100 percent¹⁵ leads to a 2.7 and 3.4 percentage point increase in voter turnout respectively. Including control variables, the effect increases to over 6 percentage points for both output variables. As has been discussed previously, these results should be interpreted with caution. Despite the inclusion of fixed effects estimates and control variables, it remains likely that results suffer from omitted variable bias and reverse causality.

Table 2: OLS - Output per Capita and Turnout

VARIABLES	(1) turnout	(2) turnout	(3) turnout	(4) turnout
total output	2.744** (0.933)	6.743*** (2.120)		
ag. output			3.417*** (1.066)	6.464*** (2.032)
political competition		3.533** (1.248)		3.674** (1.236)
political fragmentation		-0.489 (0.530)		-0.442 (0.525)
literacy		-0.468** (0.179)		-0.352* (0.170)
land ownership		-0.111 (0.179)		-0.121 (0.174)
population density		-1.927 (27.14)		-3.831 (26.57)
Observations	451	451	451	451
R-squared	0.131	0.201	0.138	0.202
State & year FE	YES	YES	YES	YES
State & year RE	NO	NO	NO	NO

Notes: a) standard errors clustered by state in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

¹⁵ Recall that output variables are expressed as the natural logarithm of output in all model specifications.

Looking at the other variables included in regressions, the only control variables that have a significant effect on voter turnout are political competition and literacy. Coefficient magnitudes suggest an election outcome with a one percentage point closer distribution of seats in state assemblies among the two main competing political groups, increases turnout with above 3 percentage points and that a one percentage point higher literacy rate decreases turnout by 0.46-0.43 percentage points. The latter result is somewhat counterintuitive, but remains in accordance with the fact that the poor and uneducated in India tend to vote at least as much as other groups. This could for instance be due to higher levels of vote buying among illiterate citizens. Although insignificant, coefficients of the other control variables are negative, suggesting that higher political fragmentation, a higher proportion of landless and higher population density all decrease turnout levels.

To more convincingly argue causality, rainfall variation is now introduced as a means to capture income variation among poor rural farmers relying on rain-fed agriculture. To establish a link between rainfall and income as well as test if the first stage in an IV-approach is strong enough, results of the impact of rainfall on output variables are presented in Table 3. Columns 1-5 use total per capita output and columns 6-10 use agricultural per capita output as dependent variables. Columns 1-3 and 6-8 uses normalized rainfall as the main independent variable, while columns 4-5 and 9-10 use the constructed drought variable. The drought dummy variable takes the value one (1) if rainfall has been one standard deviation or more below the average (drought) and zero otherwise.

As Table 3 shows, normalized rainfall variation has no significant effect on total per capita output in columns 1-2, but turns highly significant in column 3, when additional control variables are included. Results in column 3 suggest that at average rainfall levels, one standard deviation more rainfall leads to a 4.3 percent increase in total per capita output. Columns 4-5 show that drought years have a significantly negative effect on total per capita output. Moreover, normalized rainfall also has a positive and significant effect on agricultural per capita output (columns 6-8). Coefficient magnitudes indicate that at average rainfall levels, one standard deviation more rainfall leads to an approximate increase of 5-7 percent in agricultural per capita output depending on the specification. Columns 9-10 show that drought years have a significantly negative effect on agricultural output and that the effect is larger than on total output. Interpreting the coefficient in column 10, agricultural output on average decreases by 15 percent in drought years. Coefficients of the squared rainfall variable are insignificant (with high standard errors) and close to zero across specifications. Hence, no evidence of a nonlinear relationship is found. It is not surprising that rainfall has a more pronounced effect on agricultural output than on total output, as rainfall is expected to mainly affect income through an

Table 3: First-Stage 2SLS - Rainfall and Output per Capita

VARIABLES	(1) tot. output	(2) tot. output	(3) tot. output	(4) tot. output	(5) tot. output	(6) ag. output	(7) ag. output	(8) ag. output	(9) ag. output	(10) ag. output
normalized rainfall	0.0187 (0.0209)	0.0249 (0.0280)	0.0431*** (0.0125)			0.0616** (0.0270)	0.0576** (0.0263)	0.0684*** (0.0184)		
normalized rainfall^2		0.00494 (0.00758)	0.000879 (0.00598)				-0.00319 (0.00881)	-0.00622 (0.00833)		
drought				-0.0358* (0.0195)	-0.0759** (0.0325)				-0.123** (0.0500)	-0.151*** (0.0466)
literacy			0.0580*** (0.00802)		0.0573*** (0.00802)			0.0433*** (0.00655)		0.0421*** (0.00661)
land ownership			0.0111*** (0.00303)		0.0112*** (0.00311)			0.0132*** (0.00359)		0.0134*** (0.00374)
population density			1.213 (0.830)		1.279 (0.809)			1.362* (0.751)		1.480* (0.726)
political competition			0.00784 (0.0440)		0.00788 (0.0424)			-0.0101 (0.0389)		-0.0118 (0.0378)
political fragmentation			0.0662*** (0.0107)		0.0665*** (0.0104)			0.0607*** (0.0103)		0.0611*** (0.0101)
Observations	452	452	451	452	451	452	452	451	452	451
R-squared	0.809	0.809	0.950	0.809	0.950	0.784	0.784	0.924	0.782	0.922
State & year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
State & year RE	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F-test	0.806	0.790	11.88	3.364	5.452	5.209	4.794	13.81	6.014	10.55

Notes: a) standard errors clustered by state in parentheses b) Dependent variables: logarithm of total per capita output (columns 1-5), logarithm of agricultural per capita output (columns 6-10)
*** p<0.01, ** p<0.05, * p<0.1

effect on harvest size. Although hard to compare directly, results reported in Table 3 appear to be in line with previous research (e.g. Miguel et al., 2004; Cole et al., 2012). The strong and positive relation between rainfall and output variables allows for the usage of rainfall variation to capture changes in income. A necessary condition for the employed identification strategy to be valid is therefore fulfilled.

These results are also promising for the usage of rainfall as an instrument for total output and agricultural output in an IV-approach. To further test the applicability of rainfall as an instrument for these variables, F-statistics on the significance of rainfall for output variables are presented in the last row of Table 3. Although F-statistics are below the recommended safe-zone value of $F > 10$ suggested by Stock *et al.* (2002) in most specifications, F-statistics go beyond this level in columns 3, 8 and 10 that include a number of control variables in model specifications. This means that provided control variables are included, normalized rainfall is a strong enough instrument for both total output and agricultural output and, although being a somewhat weaker instrument, it should also be possible to use the drought dummy variable as an instrument for agricultural output. In addition to carefully looking at first-stage output, Angrist and Pischke (2009) as a precaution recommend to also test if reduced-form OLS specifications provide expected coefficients, t-statistics and F-statistics, since the reduced-form estimates are proportional to the causal effect of interest and, due to being OLS estimates, are unbiased¹⁶. These reduced-form relationships are looked more closely at further below.

A few additional comments can be made about results in Table 3. First, the high R-squared values ranging from 0.78 to 0.95 are mainly due to year fixed effects that capture the increase in per capita output variables over the investigated time period, which accounts for most of the sample variation in output (see graph in appendix II). Looking at control variables, across specifications literacy, low levels of land ownership and political fragmentation have a significantly positive effect on both total output and agricultural output. Population density significantly increases agricultural output, but not total output, while political competition has no significant effect on output variables.

Having established the expected connection between rainfall and output, rainfall is now used to capture income variation and to identify the effect rain-induced income shocks have on voter turnout. Results from second-stage IV-regressions are presented in Table 4. Columns 1-2 use normalized rainfall as an instrument for total per capita output and agricultural per capita output

¹⁶ Angrist and Pischke (2009) also recommend to control over-identified models by picking the strongest instrument and running a just-identified model as well as checking over-identified models with Limited Information Maximum Likelihood (LIML) estimates. As the current model used here is just-identified these steps do not apply.

respectively, while column 3 uses the drought variable as an instrument for agricultural per capita output. The same control variables as in the first-stage are included to avoid endogeneity bias.

Table 4: Second-Stage 2SLS - Output per Capita and Turnout

VARIABLES	(1) turnout	(2) turnout	(3) turnout
total output	22.54*** (8.649)		
ag. output		14.42** (5.947)	7.270 (5.620)
political competition	3.307*** (1.182)	3.682*** (1.135)	3.675*** (1.190)
political fragmentation	-1.510** (0.643)	-0.896** (0.442)	-0.462 (0.510)
land ownership	-0.246 (0.221)	-0.186 (0.201)	-0.0949 (0.196)
literacy	-1.358*** (0.524)	-0.677** (0.319)	-0.378 (0.244)
population density	-14.83 (30.51)	-6.770 (26.52)	3.770 (28.17)
Observations	451	451	451
R-squared	0.105	0.163	0.196
State & year FE	YES	YES	YES
State & year RE	NO	NO	NO

Notes: a) standard errors clustered by state in parentheses b) Instruments: normalized rainfall (columns 1-2) drought dummy variable (column 3) c) same control variables included in first- and second-stage regressions.

*** p<0.01, ** p<0.05, * p<0.1

Results in Table 4 show both total output per capita and agricultural output per capita have a significantly positive effect on voter turnout when using normalized rainfall as an instrument. Coefficient magnitudes suggest a 100 percent increase in agricultural output increases turnout by 14 percentage points and total output by 22 percentage points. Expressed differently, a negative rainfall shock decreasing aggregated agricultural output with 10 percent is expected to lower voter turnout with 1.4 percentage points and a 10 percent decrease in total output is expected to lower turnout with 2.2 percentage points. However, when the drought variable is used as an instrument for agricultural per capita output in column 3 the coefficient is insignificant, but has the same sign as in columns 1-2. One possible explanation for why there is no significance when the drought variable is used as an instrument is that it has a slightly weaker first-stage (Table 3, column 10). Moreover, there are only 35 drought observations in the sample and variation in the data is lost when redefining the rainfall variation variable into a binary dummy variable, which is likely to inflate standard errors. Another possibility could be that that years with extremely low rainfall for some reason matter less

for voter turnout. It is worth to note that coefficients have the same sign as in basic OLS specifications in Table 2, but that magnitudes are now larger. The main caveat in respect to the validity of results is that estimates might be biased due to rainfall affecting turnout through other channels than income. The most likely such channel is abundant rainfall leading to higher voting costs (destroyed infrastructure etc.). However, while results in Table 4 suggest more rainfall leads to higher turnout, this voting cost channel implies more rainfall reduces voter turnout, which is the opposite effect to the one observed. This means that if the voting cost channel is causing problems, it is biasing results downward (towards zero). Hence, in respect to the voting cost channel, results in Table 4 can be seen as a lower bound for how much rain-induced income shocks affect voter turnout. Looking at control variables, higher political competition significantly increases turnout across specifications, while literacy and political fragmentation have a significantly negative effect on turnout in columns 1-2. Coefficient signs suggest lower land ownership and higher population density decreases voter turnout, but these results are statistically insignificant.

Due to some insecurity about validity of results using an IV-approach, the reduced-form relationship between rainfall and turnout is presented in Table 5 as recommended by Angrist and Pischke (2009). Results should be proportional to IV estimates and coefficients show the same sign if IV results are unbiased. Results are also interesting in themselves as they capture the effect of a *rainfall* shock (as opposed to an *income* shock) on voter turnout and Table 3 has clearly shown that rainfall is an important determinant of income variables. Hence, although rainfall could theoretically be affecting voter turnout through other channels, it remains likely that most of the observed effect of rainfall on turnout is due to the effect rainfall has on agricultural income. Due to the arguably exogenous properties of rainfall variation in the specification it is tested if a random effects (RE) model provides consistent results. This is confirmed in results of Hausman Tests presented in Table 9 in appendix III. The null hypothesis that RE and FE coefficients are not systematically different cannot be rejected ($p=1.0$), which means RE is consistent and efficient. Therefore both fixed effects and random effects results are presented in specifications where only rainfall variables are included as independent variables.

Results in Table 5 show that rainfall has a positive and significant effect on voter turnout. At average rainfall levels, one standard deviation more rainfall results in an increase in voter turnout of around 1 percentage point across specifications. Although coefficient magnitudes cannot be compared, both sign and significance are the same as in IV results in Table 4, providing further robustness to these results. In addition, F-statistics on the significance of rainfall for voter turnout that are presented in the last row for fixed effects models are relatively strong. As previously pointed out, it is also worth noting that if rainfall decreases turnout through higher voting costs when rain has been abundant

this would counter the observed effect that more rainfall decreases turnout, making the coefficients in Table 5 biased downwards. Hence, if this is happening, the actual effect of income shocks on rainfall could be even larger than in Table 5. Coefficients of the squared rainfall variable are insignificant and relatively close to zero. This is an indication that the relationship between rainfall and voter turnout does not appear to have nonlinear properties. As in Tables 2 and 4, political competition has a positive and significant effect on voter turnout, while neither literacy nor political fragmentation are now significant. All control variables have the same signs as before.

Table 5: Reduced-Form OLS - Rainfall and Turnout

VARIABLES	(1) turnout	(2) turnout	(3) turnout	(4) turnout	(5) turnout
normalized rainfall	0.967** (0.354)	0.957*** (0.357)	1.178* (0.580)	1.171** (0.580)	0.973** (0.418)
normalized rainfall^2			0.176 (0.272)	0.179 (0.272)	0.114 (0.198)
political competition					3.662** (1.319)
political fragmentation					-0.0531 (0.524)
literacy					-0.0836 (0.209)
land ownership					-0.154 (0.167)
population density					-0.226 (26.54)
Observations	486	486	486	486	486
R-squared	0.140		0.141		0.188
State & year FE	YES	NO	YES	NO	YES
State & year RE	NO	YES	NO	YES	NO
F-test	7.480		4.115		5.412

Notes: a) standard errors clustered by state in parentheses b) R-squared and F-test values not included in columns 2 and 4 as Stata does not allow these statistics in random effects models

*** p<0.01, ** p<0.05, * p<0.1

Alternative definitions of the independent rainfall variable are used in Table 6 to see if results remain the same. In columns 1-2 the main independent variable of interest is the constructed drought variable taking the value one (1) if rainfall has been one standard deviation or more below the average and zero otherwise. In columns 3-4 it is tested if change in rainfall from the previous year matters for voter turnout, rather than deviations from the mean. Columns 5-6 interact normalized rainfall with the share of the population living in rural areas in a partially interacted model

specification to see if areas with large rural populations that are likely to rely more on rain-fed agriculture experience larger changes in voter turnout than other places when rainfall shocks occur.

Table 6: Reduced-Form OLS - Alternative Definitions of Rainfall Variable

VARIABLES	(1) turnout	(2) turnout	(3) turnout	(4) turnout	(5) turnout	(6) turnout
drought	-1.449 (0.890)	-1.104 (0.955)				
rainfall change			0.216 (0.386)	0.268 (0.434)		
rain*rural share					-5.395 (3.680)	-8.795 (5.012)
rural pop. share					-13.68 (44.12)	-33.94 (46.89)
normalized rainfall					5.169* (2.827)	7.942* (4.081)
political competition		3.700** (1.345)		3.831** (1.352)		3.816** (1.340)
political fragmentation		-0.0472 (0.525)		-0.0583 (0.493)		-0.119 (0.514)
literacy		-0.105 (0.212)		-0.138 (0.211)		-0.153 (0.198)
land ownership		-0.157 (0.172)		-0.154 (0.184)		-0.169 (0.174)
population density		1.203 (26.64)		6.771 (27.80)		0.415 (26.56)
Observations	486	486	473	473	486	486
R-squared	0.134	0.183	0.121	0.177	0.143	0.195
State & year FE	YES	YES	YES	YES	YES	YES
State & year RE	NO	NO	NO	NO	NO	NO

Notes: a) standard errors clustered by state in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Main results in columns 1-4 show expected signs given previous results, but are insignificant. The magnitude of the drought coefficient suggests voter turnout is 1.1-1.4 percentage points lower in drought years than in normal years¹⁷. As previously pointed out, this could indicate that for some reason severe drought years matter less than other years for voter turnout (even though coefficient magnitudes are at least as large as with normalized rainfall as independent variable). Another plausible reason why drought coefficients are insignificant is that there are only 35 drought observation in the data and that variation is lost when transforming rainfall data into a dummy variable. When it comes to the variable capturing change in rainfall from the previous year, columns

¹⁷ Altering the cut-off point defining a drought, does not significantly change results.

3-4 show that results are insignificant, but coefficient signs suggest an increase in rainfall compared to the previous year has a positive effect on rainfall. This is in accordance with previous results finding that more rainfall leads to higher voter turnout levels. The interaction between normalized rainfall and rural population share is insignificant. Coefficient signs suggest an increase in the rural population share decreases voter turnout at a given level of rainfall. This is opposite to the expected effect that a higher rural population share would increase the effect of rainfall on turnout and there is no obvious reason to why this is observed. One possible explanation could be that in regions with a high rural population share, income shocks for some reason affect the voting decision of poor rural citizens differently than in regions with lower rural population shares. However, not too much weight should be put on these coefficient signs, as results are not statistically different from zero.

Briefly summing up results, rain-induced income shocks that affect the rural poor appear to have a statistically significant effect on voter turnout. This allows to reject the null hypothesis that income shocks caused by exogenous rainfall variation that affect the rural poor have no significant impact on voter turnout in Indian state assembly elections. Results show that increased rainfall results in higher voter turnout and conversely that negative rainfall shocks decrease turnout levels. Results hold both for 2SLS and reduced-form models when using normalized rainfall as an instrument or main independent variable of interest. When a drought dummy variable is instead used as an instrument and independent variable respectively, results however turn insignificant, although coefficient signs suggest the same relation as before. Although impossible to rule out other channels through which rainfall might affect voter turnout, it is likely that the main channel of transmission is through the effect rainfall has on income and that income in turn affects voter turnout. If there is an alternative link between rainfall and turnout through higher voting costs due to abundant rain, this would bias the current results downward, making them a lower bound for how much rain-induced income shocks affect voter turnout.

Turning to the theoretical framework introduced earlier, negative rain-induced income shocks leading to decreases in voter turnout could be a result of 1) changed perceptions about the ability and priorities of politicians, reducing the difference in utility between different candidates gaining office (B), 2) a withdrawal effect caused by increased opportunity costs and lower capacity to participate in politics (C), 3) the shock decreasing utility from voting due to voters becoming disappointed with the performance of the incumbent or because the shock causes disappointment and disbelief in the democratic system (D) and 4) political parties having less resources to spend on vote buying and patronage, decreasing the utility of voting for those that otherwise would have sold their votes (M). It is difficult to at present determine which of these channels drive results, but this is an appropriate avenue for future research on the topic.

9. Implications of Results

This section attempts to pin down some of the implications and consequences of the results in the previous section. It is shown that results have potentially important effects on government accountability when an income shock has hit and on the ability of incumbents to get re-elected. It is also shown that increasing government calamity relief spending has a positive effect on voter turnout. It should be noted that the empirical analysis in this section is not as rigorously performed as in the main analysis above and results should therefore be seen as indicative.

As pointed out in the introduction, citizens often become dependent on the government for distributive policy in times of negative shocks to income like droughts, and previous research has shown voter turnout is an important factor in determining the size of government responses in such cases (Besley and Burgess, 2002). This makes it important to know how voter turnout is affected by the shock itself, as a change in propensity to vote among those affected, can alter the incentives for governments to respond forcefully. That is precisely what is tested in this thesis and results above reach the somewhat problematic conclusion that turnout decreases due to negative rain-induced income shocks. These results potentially have serious implications for the government support citizens hit by these shocks receive, as lower turnout due to the shock might decrease incentives for politicians to implement drought relief policies. If this is the case, the vulnerability of poor farmers is even larger when hit by a negative income shock as they cannot be sure to receive government support. In the cases they do not already exist, a possible policy response to deal with this problem is to create government funds specifically devoted to calamity relief spending on vulnerable segments of the population. These funds are then released based on pre-specified criteria, which among other indicators could be determined by rainfall levels or harvest size. The benefit with such funds is that spending on government relief becomes independent of how important the groups affected are for the re-election of the incumbent, making it less likely that groups that vote less when affected by a negative income shock are neglected.

Other research focusing on India has shown incumbents are less likely to become re-elected when a negative income shock has hit the population (Cole *et al.*, 2012; Bubb, 2008; Afzal, 2007). Results presented above suggest this might not be only due to active voters changing their preferences, but also a consequence of voters withdrawing from voting altogether. This is tested in Table 7 by attempting to capture the effects of voter turnout on incumbent performance in future elections. In addition, voter turnout is interacted with normalized rainfall in a partially interacted model specification to capture if the effect of turnout on incumbent performance varies with the amount of rainfall. This could for instance happen if voters mobilized to vote when rainfall is scarce feel differently about the incumbent than voters mobilized when rainfall has been high. The dependent

variable is defined as the change in the share of seats held by the current incumbent party¹⁸ after the next upcoming election. Columns 1-2 measure the effect of voter turnout on incumbent performance without interactions, while columns 3-4 and 5-6 interact voter turnout with normalized rainfall and the constructed drought variable respectively. Columns 2, 4 and 6 include the same control variables as earlier.

Table 7: Turnout and Incumbent Election Performance

VARIABLES	(1) incumbent	(2) incumbent	(3) incumbent	(4) incumbent	(5) incumbent	(6) incumbent
turnout	0.225*** (0.0556)	0.240** (0.102)	0.220*** (0.0529)	0.236** (0.100)	0.206*** (0.0517)	0.230** (0.0896)
rainfall*turnout			-0.000913 (0.00485)	0.00252 (0.00617)		
normalized rainfall			0.473 (1.090)	0.534 (1.075)		
drought*turnout					0.121 (0.149)	0.125 (0.149)
drought					-7.133 (10.33)	-7.570 (10.43)
land ownership		-0.0543 (0.0753)		-0.0543 (0.0738)		-0.0457 (0.0698)
literacy		0.0752 (0.244)		0.105 (0.235)		0.1000 (0.148)
political competition		-2.053 (2.007)		-2.107 (2.075)		-2.118 (1.866)
political fragmentation		-0.921*** (0.291)		-0.907*** (0.282)		-0.659** (0.270)
population density		12.30 (10.37)		11.10 (9.669)		13.44 (11.06)
Observations	472	472	471	471	486	486
R-squared	0.214	0.243	0.215	0.244	0.213	0.239
State & year FE	YES	YES	YES	YES	YES	YES
State & year RE	NO	NO	NO	NO	NO	NO

Notes: a) standard errors clustered by state in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Results show voter turnout appears to have a significantly positive impact on incumbent election performance. An increase in turnout of 1 percentage point increases the share of state assembly seats held by the incumbent after the next election by slightly above 0.2 percentage points. This finding suggests voter turnout is an important factor for election outcomes, further increasing the

¹⁸ The incumbent party is defined as the party the current chief minister (that heads state governments) belongs to.

relevance of studying what determines voter turnout, including what the effects of income shocks on turnout are. It also means incumbents on average have an interest in maintaining high turnout levels. However, interacting turnout with rainfall variables does not appear to have a significant effect on incumbent electoral performance, suggesting that the effect of turnout on incumbent performance does not depend significantly on rainfall levels. The direct effect of turnout on incumbent performance remains similar to columns 1-2 in both significance and magnitudes. This makes sense as it captures the effect of turnout on incumbent performance when normalized rainfall is zero (which corresponds to average rainfall) in columns 3-4 and when there has not been a drought in columns 5-6. An important caveat to results in Table 7 is that they might be biased due to omitted variables and simultaneity (skilled incumbents might have a positive effect on turnout and be more likely to perform well in future elections), which is why they should be interpreted with caution. Nevertheless, results still provide an indication that turnout is an important factor for election results and consequently that income shocks affect election outcomes not only by changing which candidates that those who turn out vote for, but also by decreasing overall turnout levels.

The research by Cole *et al.* (2012) also suggests that the incumbent disadvantage due to negative rain-induced income shocks decreases if the government response to the shock has been ambitious. Again, given the results presented above, this could either be due to active voters changing preferences or due to relief spending making voters more likely to cast a ballot at all. Table 8 tests the latter possibility by looking at the effect of relief spending on turnout and by interacting relief expenditure with rainfall variables in a partially interacted model specification, which allows to examine if the effect of relief expenditure on turnout varies with rainfall levels. In regressions, relief spending is defined as the logarithm of reported per capita state government expenditure on public food distribution and other interventions defined as calamity relief by the Indian Ministry of Food and Agriculture and the Reserve Bank of India. Columns 1-2 test the direct effect of relief spending on voter turnout, columns 3-4 interact relief spending with normalized rainfall and columns 5-6 interact relief spending with the drought variable.

Table 8: Rainfall, Relief Spending and Turnout

VARIABLES	(1) turnout	(2) turnout	(3) turnout	(4) turnout	(5) turnout	(6) turnout
relief spending	0.443** (0.191)	0.464** (0.167)	0.440** (0.191)	0.466** (0.169)	0.430** (0.183)	0.467** (0.160)
rainfall*relief			0.229* (0.125)	0.204* (0.105)		
normalized rainfall			0.495 (0.451)	0.362 (0.488)		
drought*relief					0.0253 (0.335)	-0.113 (0.229)
drought					-1.338* (0.687)	-0.681 (0.884)
political competition		3.821** (1.489)		3.772** (1.438)		3.832** (1.502)
political fragmentation		-0.104 (0.494)		-0.140 (0.494)		-0.124 (0.495)
literacy		-0.134 (0.184)		-0.136 (0.193)		-0.154 (0.190)
land ownership		-0.155 (0.159)		-0.157 (0.154)		-0.163 (0.161)
population density		-0.567 (25.26)		-1.404 (25.03)		-0.392 (25.34)
Observations	487	487	486	486	486	486
R-squared	0.160	0.210	0.171	0.219	0.162	0.212
State & year FE	YES	YES	YES	YES	YES	YES
State & year RE	NO	NO	NO	NO	NO	NO

Notes: a) standard errors clustered by state in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Results in Table 8 clearly show that relief spending has a significantly positive effect on voter turnout across specifications, including when rainfall has been at average levels (columns 3-4) and when there has been no drought (columns 5-6). Coefficient magnitudes indicate that doubling relief spending, increases voter turnout by approximately 0.45 percentage points. The interaction term is positive and significant in columns 3-4. Given that the direct effect of rainfall on turnout is controlled for, one way this term can be interpreted is as the generosity of government relief spending given the level of need for such spending. A positive coefficient then means that generous relief spending (given the level of need) translates into higher voter turnout, which makes sense considering previous results that negative income shocks lead to lower turnout (when relief is generous some of the negative effects of shocks are countered). Interpreting coefficient magnitudes in column 4, when rainfall has been one standard deviation lower than normal, doubling relief spending increases voter turnout by 0.251 (0.458 + (-1*0.207)) percentage points, which is lower than when rainfall has been

at the average level (0.458). This also makes sense, as the level of need is larger when rainfall is low, making a doubling of relief spending less generous than a corresponding doubling of spending when rainfall has been higher (which in turn translates into a smaller effect on turnout). Hence, to get a corresponding increase in turnout, a higher increase in relief spending is necessary when rainfall has been scarce as compared to when rain levels are higher. Interaction terms are insignificant in columns 5-6 and have opposite signs depending on the specification, making it hard to draw any conclusions. Although remaining interesting and providing important indicative evidence on the effect of relief spending on turnout, these results must be treated with caution due to the risk of endogeneity bias. In particular, it could be the case that voter turnout also has an effect on relief spending (as argued by Besley and Burgess (2002)), causing reversed causality concerns.

An important conclusion from results in this section is that although it is potentially problematic that negative rain-induced income shocks decrease turnout due to creating reduced incentives for governments to provide relief, there is indicative evidence suggesting government *do* have incentives to respond forcefully to shocks as a decrease in turnout on average reduces incumbent performance and that decreases in turnout due to income shocks can partly be countered by increasing relief spending. Hence, indicative findings here suggest Indian state governments have an interest in countering the negative effects negative income shocks have on voter turnout and that this can partly be done by increasing relief spending.

10. Conclusion

This thesis tests the effect of income shocks on voter turnout in India. To more convincingly argue causality, rainfall is used to capture exogenous income variation among the rural poor dependent on rain-fed agriculture in 15 major Indian states over the years 1959-1990. In total, 110 state assembly elections are included in the sample. To my knowledge this is the first attempt to capture the relationship between income shocks and voter turnout in a developing country context and the work contributes to the scarce previous research on the topic by employing an identification strategy that arguably allows to identify causality. The exploitation of rainfall variation also makes it possible to isolate the effect income shocks have on the rural poor that are particularly vulnerable to such shocks.

Results suggest variation in income caused by the effect rainfall has on harvest size, significantly impacts voter turnout among those affected. When using normalized rainfall as either an instrument for output variables or in reduced-form model specifications testing the direct effect of rainfall on turnout, it is found that an increase in rainfall, resulting in higher output, significantly increases voter turnout. Conversely, negative shocks to income reduce voter turnout. More specifically, using

normalized rainfall as an instrument for total per capita output and agricultural per capita output reduces voter turnout by 2.2 and 1.4 percentage points respectively. When the direct effect of rainfall on voter turnout is tested in reduced-form model specifications it is found that one standard deviation less rainfall decreases turnout by approximately 1 percentage point. However, when a constructed drought dummy variable is used as either an instrument for agricultural output or independent variable in reduced-form OLS specifications, no significant effects are found, although coefficient signs confirm previous results. Lack of significance when using the drought variable might be explained by a low number of drought observations in the data and by lost variation when creating a binary dummy variable. Another possibility is that severe drought years for some reason matter less for voter turnout than other years. The main caveats to results are that there is a certain possibility that rainfall can have an effect on voter turnout through other channels than income and that there could possibly exist sources of measurement error in the data.

The channels through which income shocks can have a negative effect on voter turnout in India are identified with the theoretical framework used to discuss determinants of voter turnout. First, an income shock might alter voters' valuation of candidates or which issues they prioritize, making the difference in utility depending on who wins smaller, and thus reducing the benefits of voting (B in the model). Second, the opportunity cost of voting might increase, as poor farmers now have to find alternative sources of income and therefore have less time and resources to inform themselves about candidates and take time to vote (C in the model). Third, the expressive benefit from voting (D in the model) might decrease due to lower utility derived from supporting the democratic system or a certain candidate by voting. Fourth, political parties can have less resources to spend on vote buying and patronage in times of negative income shocks, decreasing the utility of voting for those that otherwise would have sold their votes (M in the model). An important avenue for future research is to more deeply investigate through which channels income shocks affect voter turnout. The theoretical part of this thesis has discussed which these channels are likely to be in a developing country like India, but further empirical work is needed to understand which of these mechanisms drive observed results.

Given that voter turnout is an important factor for democratic accountability and that turnout appears to have an effect on the willingness of governments to respond to income shocks with calamity relief spending, results have potentially large implications. More specifically, there is a risk that governments will not prioritize relief spending on vulnerable citizens if negative income shocks themselves reduce voter turnout among the affected and thereby weakens the accountability effect voting is likely to have on incumbents seeking re-election. However, indicative evidence provided shows that there might be other factors at play that could at least partly counter the negative effects

decreased voter turnout due to income shocks can have on the willingness of politicians to implement strong policy responses to negative income shocks. First, indicative results suggest incumbents are less likely to get re-elected when voter turnout is low. An increase in voter turnout of 1 percentage point increases the share of seats held by the incumbent by around 0.2 percentage points. Second, suggestive evidence that calamity relief spending has a significantly positive effect on voter turnout is provided. Combined, these two findings indicate that incumbents that seek re-election have an incentive to encourage high voter turnout and that this can partly be achieved by increasing relief spending.

The main result that negative income shocks decrease voter turnout, adds to the understanding of political participation among poor rural citizens in India and provides further insights on how income shocks affect poor segments of the population. Due to the unique attributes of Indian democracy, results cannot necessarily be assumed to fully hold in other contexts and regions. With that said, it is likely that evidence from a country like India is a better reference for other developing countries than fully developed, mature democracies, where previous research on the topic has been conducted. To find out if results presented here are unique to India or a sign of a more broadly observed pattern across less developed democracies, additional empirical research on the effects of income shocks on voter turnout is called for.

11. References

- Afzal, Madiha (2007) "Voter Rationality and Political Incentives: Exploiting Luck in Indian and Pakistani Elections" *Yale University Manuscript*
- Ahuja, Amit; Chhibber, Pradeep (2012) "Why the Poor Vote in India: 'If I Don't Vote, I am Dead to the State'" *Studies in Comparative International Development*, Vol. 47 Issue 4, pp. 389-410
- Angrist, Joshua; Pischke, Jörn-Steffen (2009) *Mostly Harmless Econometrics: An Empiricist's Companion*, Princeton University Press, New Jersey, United States
- Arcelus, Francisco; Meltzer, Allan H (1975) "The Effect of Aggregate Economic Variables on Congressional Elections" *American Political Science Review*, 69:1232-9
- Arezki, Rabah; Brückner, Markus (2011) "Rainfall, Financial Development and Remittances: Evidence from Sub-Saharan Africa" *IMF Working Paper*, WP/11/153
- Banjeree, Mukuklika (2007) "Sacred Elections" *Economic & Political Weekly*, Vol. 42 No. 17
- Banjeree, Abhijit; Duflo, Esther (2011) *Poor Economics: A Radical Rethinking of the way to Fight Global Poverty*, Public Affairs, New York, United States
- Besley, Timothy; Burgess, Robin (2002) "The Political Economy of Government Responsiveness: Theory and Evidence from India" *Quarterly Journal of Economics*, Vol. 114 no. 4, pp. 1415-1451
- Blais, André *et al.* (2000) "Socio-Economic Status and Non-Voting: A Cross-National Comparative Analysis"; *IPSA 2000, XVIII World Congress of the International Political Science Association*
- Blais, André (2006) "What Affects Voter Turnout?" *Annual Review of Political Science*, Vol. 9, pp. 111-125
- Björkman-Nyqvist (2013) "Income Shocks and Gender Gaps in Education: Evidence from Uganda" *Journal of Development Economics*, Vol. 105, pp. 237-253
- Bohlken, Anjali; Sergenti, Ernest (2010) "Economic Growth and Ethnic Violence: An Empirical Investigation of Hindu-Muslim Riots in India" *Journal of Peace Research*, Vol. 47 no. 5, pp. 589-600
- Booth, John; Seligson, Mitchell (2008) "Inequality and Democracy in Latin America: Individual and Contextual Effects of Wealth on Political Participation", in *Poverty, Participation and Democracy*, ed. Krishna, Anirudh, Cambridge University Press
- Bound, John; Jaeger, David; Baker, Regina (1995) "Problems with Instrumental Variable Estimation when the Correlation between the Instrument and the Endogenous Explanatory Variable is Weak", *Journal of the American Statistical Association*, Vol. 90, no. 430
- Bratton, Michael (2008) "Poor People and Democratic Citizenship in Africa" in *Poverty, Participation and Democracy*, ed. Krishna, Anirudh, Cambridge University Press
- Brennan, G.; Hamlin, A. (1998) "Expressive Voting and Electoral Equilibrium", *Public Choice*, Vol. 95, pp. 149-175
- Brückner, Markus; Ciccone, Antonio (2011) "Rain and the Democratic Window of Opportunity" *Econometrica*, Vol. 79 no. 3
- Bubb, Ryan (2008) "Blame It on the Rain? Voter Rationality and Exogenous Economic Shocks", *Working Paper, Department of Economics, Harvard University*

Burden, Barry; Wichowsky, Amber (2012) "Unemployment and Voter Turnout" *APSA 2012 Annual Meeting Paper*

Butler, David; Lahiri, Ashok; Roy, Prannoy (1995) *India Decides: Elections 1952-1995*, Books & Things, United States

Carlin, Ryan; Singer, Mathew (2013) "Context Counts: The Election Cycle, Development, and the Nature of Economic Voting" *The Journal of Politics*, Vol. 75 no. 03, pp. 730-742

Chandra, Kanchan (2004) *Why Ethnic Parties Succeed: Patronage and Ethnic Headcounts in India*, Cambridge University Press, Cambridge

Chandra, Bipan; Mukherjee, Mridula; Mukherjee, Aditya (2008) *India since Independence*, Penguin Books India, revised edition

Charles, Kerwin Kofi; Stevens, Melvin (2013) "Employment, Wages and Voter Turnout" *American Economic Journal: Applied Economics*, Vol. 5 No.4, pp.111-143

Cole, Shawn (2009) "Fixing Market Failures or Fixing Elections? Agricultural Credit in India", *American Economic Journal: Applied Economics*, Vol.1 no.1, pp. 219-250

Cole, Shawn; Healy, Andrew; Werker, Eric (2012) "Do Voters Demand Responsive Governments? Evidence from Indian Disaster Relief" *Journal of Development Economics*, Vol. 97, pp. 167-181

Dalton, Russell J. (2006) *Citizen Politics: Public Opinion and Political Parties in Advanced Industrial Democracies*; fourth edition, CQ Press, Washington D.C., United States

Datt, Gaurav; Ozler, Berk; Ravallion, Martin (1996) *A Database on Poverty and Growth in India*, Poverty in India 1950-1990 project

Dhillon, Amirta; Peralta, Susana (2002) "Economic Theories of Voter Turnout" *The Economic Journal*, Vol. 112, pp. 332-352

Downs, Anthony (1957) *An Economic Theory of Democracy*, Harper & Brothers, New York, United States

Droogers, Peter; Seckler, David; Makin, Ian (2001) "Estimating the Potential of Rain-Fed Agriculture" *International Water Management Institute*, Working Paper 20

Dunning, Thad; Stokes, Susan; Brusco, Valeria; Nazareno, Marcelo (2013) *Brokers, Voters and Clientelism: The Puzzle of Distributive Politics*, Cambridge University Press

Economic Organisation and Public Policy Programme, "Indian State Data" *London School of Economics*, http://sticerd.lse.ac.uk/eopp/new/data/indian_data/default.asp Downloaded 2014-03-25

FAO - Food and Agricultural Organization (2014) "Country Data – India", available at <http://www.fao.org/nr/water/espim/country/india/index.stm>, Downloaded: 2014-05-08

Fiorina, Morris (1978) "Economic Retrospective Voting in American Elections: A Micro-Analysis" *American Journal of Political Science*, Vol. 22 no. 2, pp. 426-443

Franklin, Mark (2004) *Voter Turnout and the Dynamics of Electoral Competition in Established Democracies Since 1945*, Cambridge University Press, Cambridge, UK

- Geys, Benny (2006a) "'Rational' Theories of Voter Turnout: A Review" *Political Studies Review*, 2006 Vol. 4, pp. 16-35
- Geys, Benny (2006b) "Explaining Voter Turnout: A Review of Aggregate Level Research" *Electoral Studies*, Vol. 25, pp. 637-663
- Griffin, John; Newman, Brian (2005) "Are Voters Better Represented?" *Journal of Politics*, Vol. 67 no. 4, pp. 1206-1227
- Haque, Trina; Sirohi, Amar Singh (1986) *Agrarian Reforms and Institutional Change in India*, Concept Publishing Co., United States
- Horiuchi, Yusaku; Saito, Jun (2009) "Rain, Elections and Money: The Impact of Voter Turnout on Distributive Policy Outcomes in Japan" *Asian Pacific Economic Paper*, No. 379
- IDEAS – International Institute for Democracy and Electoral Assistance (2011), "Voter Turnout Data for India", <http://www.idea.int/vt/countryview.cfm?id=105> Downloaded 2014-03-14
- Inglehart, Ronald; Norris, Pippa (2003) *Rising Tide: Gender Equality and Cultural Change around the World*, Cambridge University Press, Cambridge
- Kinder, Donald R.; Kiewiet, Roderick (1981) "Sociotropic Politics: The American Case." *British Journal of Political Science*, 11:129-61
- Kochar, Anini (1995) "Explaining Household Vulnerability to Idiosyncratic Income Shocks" *The American Economic Review*, Vol. 85 no. 2, pp. 159-164
- Krishna, Anirudh (2008) "Do Poor People Care Less for Democracy? Testing Individual-Level Assumptions with Individual Level Data from India", in *Poverty, Participation and Democracy*, ed. Krishna, Anirudh, Cambridge University Press
- Klasen, Stephan; Wink, Claudia (2003) "'Missing Women': Revisiting the Debate" *Feminist Economics*, Vol. 9, pp. 263-299
- Lijphart, Arend (1997) "Unequal Participation: Democracy's Unresolved Dilemma", *American Political Science Review*, Vol. 91 no. 1, pp. 1-14
- Loose, Krista; Jae, David Hyun-Saeng (2011) "Explaining Unequal Participation: The Differential Effects of Winter Weather on Voter Turnout" *MIT Political Science Department*, Working Paper no. 2011-13
- Martin, Paul (2003) "Voting's Rewards: Voter Turnout, Attentive Publics and Congressional Allocation of Federal Money" *American Journal of Political Science*, Vol. 47 no.1, pp. 110-127
- Mehta, Pratab Bhanu (2003) *The Burden of Democracy*, Penguin Books, New Delhi
- Miguel, Edward; Satyanath, Shanker; Sergenti, Ernest (2004) "Economic Shocks and Civil Conflict: An Instrumental Variable Approach" *Journal of Political Economy*, Vol. 112 no. 4
- Miguel, Edward (2005) "Poverty and Witch Killing" *Review of Economic Studies*, Vol. 72, pp. 1153-1172
- Mitra, Subrata; Enskat, Mike (1999) "Parties and the People: India's Changing Party System and the Resilience of Democracy" in *The Resilience of Democracy: Persistent Practice, Durable Idea*, eds. Burnell, Peter; Calvert, Peter, Frank Cass Publishers, United States

- Mitra, Subrata; Singh, V. B. (1999) *Democracy and Social Change in India: A Cross-Sectional Analysis of the National Electorate*, SAGE Publications, United States
- Morduch, Jonathan (1994) "Poverty and Vulnerability" *The American Economic Review*, Vol. 84 no.2, pp. 221-225
- Mulhainathan, Sendhil; Shafir, Eldar (2013) *Scarcity: Why Having Too Little Means So Much*, Times Books, United States
- Nie, Norman; Junn, Jane; Stehlik-Barry, Kenneth (1996) *Education and Democratic Citizenship in America*, The University of Chicago Press, Chicago, United States
- Olson, Mancur (1965) *The Logic of Collective Action*, Harvard University Press, Cambridge Massachusetts, United States
- Parry, Jonathan (2000) "The Crisis of Corruption and the Idea of India" in *Morals of Legitimacy: Between Agency and System*, ed. Pardo, Italo, Berghahn Books, United States
- Pintor, Rafael; Grasczew, Maria (2002) "Voter Turnout since 1945: A Global Report", *Institute for Democracy and Electorate Assistance*
- Przeworski, Adam; Stokes, Susan; Manin, Bernard (1999) *Democracy, Accountability and Representation*, Cambridge University Press
- Roberts, Andrew (2008) "Hyperaccountability: Economic Voting in Central and Eastern Europe" *Electoral Studies*, Vol. 27, pp. 533-546
- Riker, William; Ordeshook, Peter (1968) "A Theory of the Calculus of Voting", *American Political Science Review*, Vol. 62, pp. 25-42
- Rosenstone, Steven (1982) "Economic Adversity and Voter Turnout" *American Journal of Political Science*, Vol. 26 No. 1, pp. 25-46
- Rosenstone, Steven; Hansen, John Mark (1993) *Mobilization, Participation, and Democracy in America*, Macmillan, New York, United States
- Schuessler, Alexander (2000) *A Logic of Expressive Choice*, Princeton University Press, Princeton, New Jersey, United States
- Schumpeter, Joseph (1942) *Capitalism, Socialism and Democracy*, Harper & Brothers, New York, United States
- Schur, Lisa (2003) "Employment and the Creation of an Active Citizenry" *British Journal of Industrial Relations* 41:751-71
- Sen, Amartya; Drèze, Jean (1989) "Hunger and Public Action" in *Omnibus*, eds. Sen, Amartya; Drèze, Jean, Oxford University Press, New Delhi
- Sen, Amartya (1990) "More than 100 Million Women are Missing" *The New York Review of Books*, December 20, 1990
- Sen, Amartya, Drèze Jean (1996) *India: Economic Development and Social Opportunity*, Oxford University Press, New Delhi
- Shah, Manisha; Steinberg, Bryce (2012) "Could Droughts Improve Human Capital? Evidence from India"

- Sharma, Shalendra (2003) "Indian Politics", in *Understanding Contemporary India*, eds. Ganguly, Sumit; DeVotta, Neil; Lynne Rienner Publishers, Colorado, United States
- Stock, James; Wright, Jonathan; Yogo, Motohiro (2002) "A Survey of Weak Instruments and Weak Identification in Generalized Method of Moments" *Journal of Business & Economic Statistics*, Vol. 20, pp. 518-529
- Strömberg, David (2004) "Radio's Impact on Public Spending", *The Quarterly Journal of Economics*, Vol. 119 no. 1, pp. 189-221
- Southwell, Priscilla L. (1988) "The Mobilization Hypothesis and Voter Turnout in Congressional Elections, 1974-1982" *Western Political Quarterly* 41:273-87
- The Economist (2014) "India's New Voters: We Are Connected" *The Economist Print Edition*, April 5-11, 2014 Issue
- The Hindu (2011) "Cash for Votes a Way of Political Life in South India", Published March 16, 2011, <http://www.thehindu.com/news/the-india-cables/cash-for-votes-a-way-of-political-life-in-south-india/article1541302.ece> Downloaded 2014-03-27
- Uppal, Yogesh (2009) "The Disadvantaged Incumbents: Estimating Incumbency Effects in Indian State Legislatures" *Public Choice*, Vol. 138 no. 1, pp. 9-27
- Verba, Sidney; Brady, Henry; Schlozman, Kay (1995) "Beyond SES: A Resource Model of Political Participation", *American Political Science Review*, Vol. 89 no. 2
- World Bank (2012) "India Overview", <http://www.worldbank.org/en/country/india> , Downloaded 2014-03-14
- Yadav, Yogendra (1999) "Electoral Politics in the Time of Change: India's Third Electoral System" *Economic and Political Weekly*, Vol. 34, no. 35

Appendix I

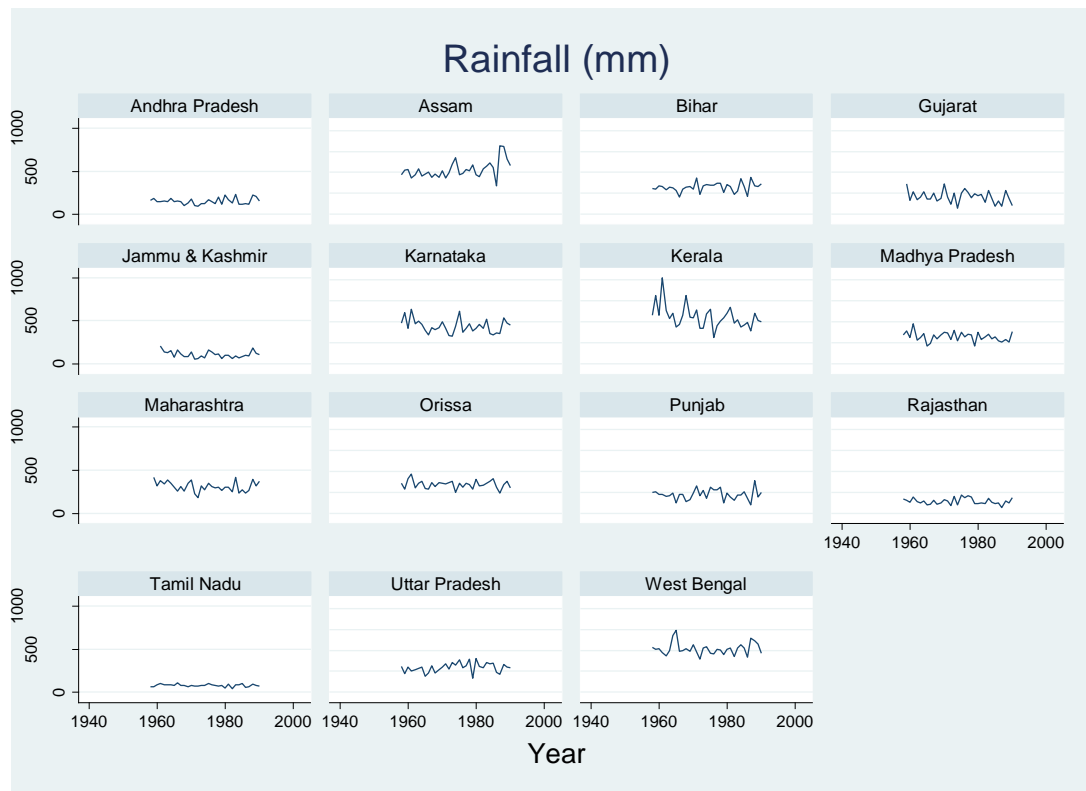
All variables except literacy levels have been constructed using data compiled by the Economic Organization and Public Policy Programme (EOPP) of the London School of Economics and is available at http://sticerd.lse.ac.uk/eopp/new/data/indian_data/default.asp. The EOPP has in turn collected data from a number of different sources. These sources and more details on how variables are constructed is summarized in Table 9 below.

Table 9: Data Sources and Variable Descriptions

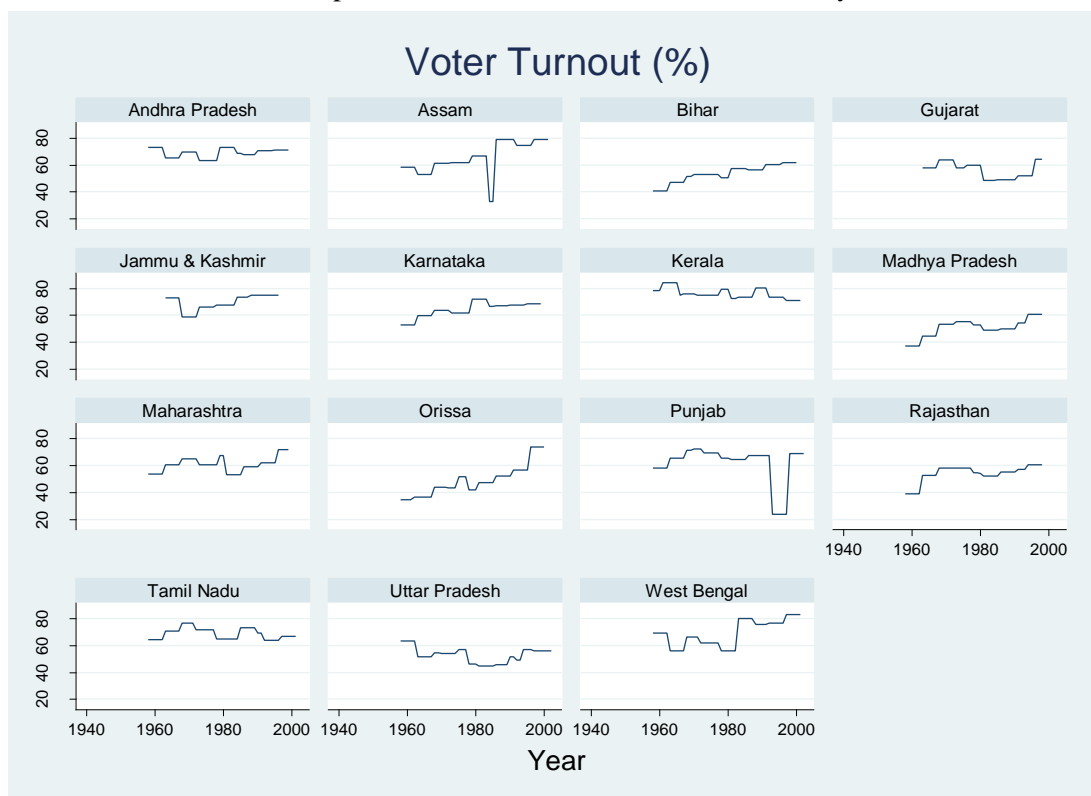
VARIABLES	SOURCES & DESCRIPTION
Voter turnout	Total votes (valid and invalid) as a proportion of the total electorate (%). Data originates from Butler <i>et al.</i> (1995) and has been updated with data from the Election Commission of India.
Rainfall	Monthly average rainfall by state (mm). Compiled with data from weather stations. Data originates from a World Bank dataset prepared by Datt <i>et al.</i> (1996).
Drought	Dummy variable coded to take value one (1) if rainfall has been one standard deviation or more below average (drought) and zero otherwise (no drought). See “rainfall” variable for information on data and sources.
Total output & agricultural output	Net state domestic product of all sectors and of the agricultural sector respectively ('00000 Indian rupees). In regressions expressed as the logarithm of output per capita. Data originates from a World Bank dataset prepared by Datt <i>et al.</i> (1996).
Literacy	Share of total population over seven years old that is literate (%). India census data obtained from the Office of the Registrar General, Ministry of Home Affairs.
Land ownership	The share of households that do not own land (%). Data mainly originates from Haque and Sirohi (1986).
Population density	Number of people per km ² . Constructed by dividing total population by land area (km ²). Data originates from a World Bank dataset prepared by Datt <i>et al.</i> (1996) and statistics from the Office of the Registrar General, Ministry of Home Affairs, India.
Political competition	Minus the absolute difference between the proportion of assembly seats held by the Congress party and the proportion held by its main competing group of parties as defined by Besley and Burgess (2002). Main competing group of parties varies between states and over time. Groups included are Janata Parties, Regional Parties, Hindu Parties and Hard Left Parties. Data originates from Butler <i>et al.</i> (1995) and has been updated with data from the Election Commission of India.
Political fragmentation	Candidates per seat in state assembly elections. Constructed by dividing the number of candidates by the number of seats in state assemblies. Data originates from Butler <i>et al.</i> (1995) and has been updated with data from the Election Commission of India.
Incumbent performance	Change in share of state assembly seats held by the incumbent after the next upcoming election. Constructed by subtracting the old share of seats with the new share of seats held by the incumbent. Data originates from Butler <i>et al.</i> (1995) and has been updated with data from the Election Commission of India.
Calamity relief spending	State government expenditure on public food distribution and other interventions defined as calamity relief by the Indian Ministry of Food and Agriculture and the Reserve Bank of India. In regressions expressed as the logarithm of relief expenditure per capita.

Appendix II

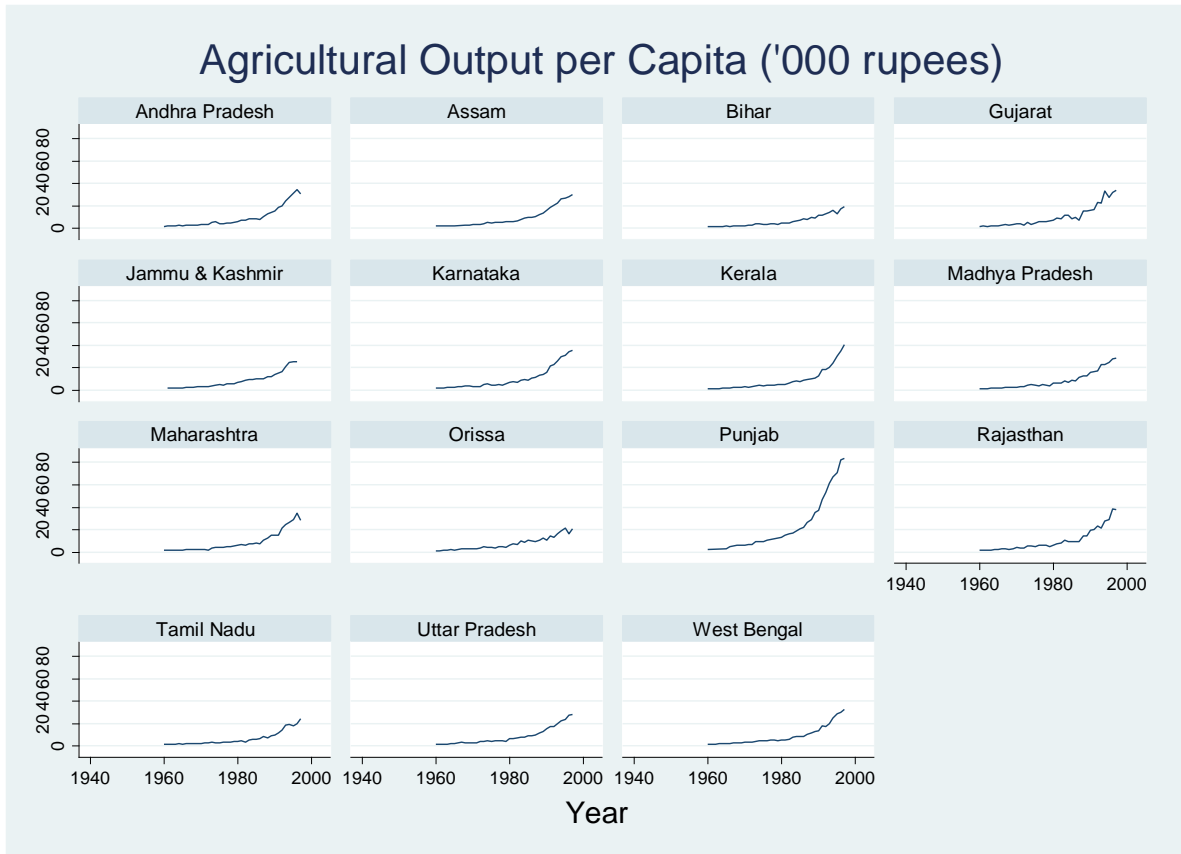
Graph 1: Rainfall Variation over Time by State



Graph 2: Voter Turnout Variation over Time by State



Graph 3: Agricultural Output Variation over Time by State



Appendix III

Table 10: Hausman Tests

VARIABLE	Fixed Effects Coefficient	Random Effects Coefficient	Difference FE vs. RE	H0: Coefficient difference not systematic (chi2)
normalized rainfall (col. 1-2)	0.967	0.957	0.0100	1.34 (p=1.0)
normalized rainfall (col. 3-4)	1.178	1.171	0.0062	0.19 (p=1.0)

Notes: Hausman test null hypothesis that that difference between FE and RE coefficients is not systematic cannot be rejected (p-value in parenthesis). The first row compares FE and RE coefficients in columns 1-2 of Table 5 and the second row compares columns 3-4 of Table 5.