THREE ESSAYS IN DEVELOPMENT ECONOMICS

By

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ABSTRACT

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Households experience many types of micro and macro level exogenous shocks. This dissertation includes three essays that focus on household and individual level welfare effects and coping strategies to shocks. In the first essay, I examine the role of risk preferences in the adoption decision of climate smart technology that helps farmers cope with water shortages due to changing climate. In the second essay I estimate the impact of in-utero weather shock on child's nutrition status and whether the effects differ by household income, implying different coping strategies used by rich versus poor households. In my final essay, I focus on the impact of macro-level political shocks when three large states in India were divided into smaller states and estimate the developmental outcomes of this division on both the new and the parent states.

My first essay is situated in the literature of technology adoption with a focus on role of risk preferences in adoption decision. I conducted household surveys and a field experiment to elicit the risk preference of farmers from two northern states in India; and used them to explain their adoption decision of Laser Land Leveler. This technology is primarily a water saving technology and is therefore very useful in this region of India under growing ground water stress. Along with reducing water use, this technology also reduces greenhouse gas emission, and is therefore termed as a climate smart technology. Our analyses extend the measurement of risk preferences beyond expected utility theory by incorporating prospect theory. I use survival analysis as my empirical strategy to model time to adoption and find that risk averse farmers and farmers who overvalue smaller probabilities tend to adopt this technology sooner than others.

My second essay examines the impact of rainfall shocks during gestational period that pregnant mothers in Malawi experience on the health outcomes of their children less than 5 years of age. About 85% of Malawians reside in rural areas and most of them depend on agriculture. With almost no irrigation system in place, the reliance on natural rainfall is high and therefore shifts in rainfall patterns highly affect their lives. I find that higher rainfall in the in-utero period is associated with better child nutrition outcomes, but excessive rainfall negatively affects child's health. We also find that these effects persist until initial years for all children. However, for children from richer households the effects seem to fade away over time, but for children born in poorer households, these effects persist longer term.

My third essay focusses on the role of greater autonomy or more homogenous jurisdictions on development indicators. In this essay I examine the case of India where the splitting of three bigger states lead to the creation of three new states in the year 2000. Since states can be considered as the proximate determinants of local institutions driving developmental outcomes, a change in their boundaries provides an opportunity to evaluate the impact of these shifts on the provision of public goods and services. I use the comprehensive datasets of Demographic Health Survey and apply quasi-experimental methods to show that districts in the newly created states on average are doing better than the parent states on development indicators after splitting from their parent states. We find that splitting of states has induced better governance, service delivery, and significantly improved living standards and development outcomes in the newly formed states but negative effect in the parent states post-split. The results of this study provide new evidence that institutions matter for development, and local control of institutions can have large economic impacts on the smaller state that is separating from a larger state.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

In most developing countries, households experience exogenous shocks that significantly determine their developmental outcomes. Some of these shocks have varying effects on households and individuals depending on their characteristics, and thus require micro-level coping strategies, while other shocks affect large geographical areas like a district, state or a country and have macro-level developmental impacts. In this dissertation I present three essays that explore the welfare impacts of such exogenous micro and macro level shocks felt at individual and household levels. While the first two essays focus on micro level shocks and coping mechanisms, the third essay explores the welfare effects of an exogenous macro level shock.

The first essay focusses on a micro level shock and examines the role of risk preferences in the adoption decision of a climate smart technology. This technology helps Indian farmers cope with the exogenous shock of climate change and declining ground water table. Both, climate change and declining water table are major issues affecting a majority of farmers in northern India, where this study was conducted (Bates et al. 2008). On the one hand, changing climate makes precipitation less predictable and on the other hand, groundwater aquifers are dwindling due to over-exploitation (Hanjra and Qureshi 2010) leading to water crisis for irrigation in this entire region. The intensity of the problem is felt heterogeneously among the farmers based on their ground water level and availability of other sources of irrigation water like canals. Adoption of laser land leveler technology saves irrigation water significantly and is therefore considered as a coping mechanism for irrigation water scarcity. As this technology seems to reduce risk, it is likely that farmer's risk preferences will influence its adoption decision. I therefore elicited farmers' risk preferences using lab-in-field type experiments and use them to explain their adoption decisions.

The second essay underscores the impact of a micro level weather shock on child health. This essay examines how rainfall shocks during gestational period that Malawian pregnant mothers experience affects the health outcomes for children when they are less than 5 years of age. A significant majority of Malawians live in rural areas and depend on agriculture for their livelihood, making the rainfall events extremely important for their lives. In the absence of modern irrigation technology and social safety nets, any rainfall shocks are likely to have wide ranging consequences for these people. As almost all of Malawian agriculture is rain fed, a reduced rainfall will directly affect the production of food grain leading to a lower nutrient intake of the household members. Furthermore, reduced rainfall can increase the stress on the existing water resources, decreasing the quantity and quality of clean water availability for personal hygiene, and increase the time to collect water (Mara, 2003; Sobsey, 2002). A combination of less nutritious food and poor sanitation is likely to have a negative effect on a pregnant woman. Fetal Origin Hypothesis (FOH) clearly underscores the importance of in utero period in determining the nutritional status and shaping the future abilities and health trajectories of a baby (Barker, 1999). According to the Fetal Origin Hypothesis, an exogenous rainfall shock that induces lower nutrient intake and poor sanitation during the in-utero period is highly likely to have an effect on child's health. This essay is an attempt to quantify such effects for different groups of people in society and draws policy implications to mitigate the effects of such shocks on vulnerable population.

The third essay focusses on a macro level shock of political reorganization of large Indian states on the developmental outcomes for people residing in those states. In the year 2000, three large states of India were split into six smaller states. Since states can be considered as the proximate determinants of local institutions driving developmental outcomes, a change in their borders provides an opportunity to evaluate the impact of such a macro shock on the provision of public goods and services. Smaller states tend to represent the political aspirations of the residents of the states much better as key political decisions are taken geographically closer to them. As the formation of the new states were broadly on the lines of linguistic and ethnic composition, creation of smaller states leads to more homogenous states. Linguistic compatibility and cultural homogeneity are likely to facilitate better management, implementation, and allocation of public resources in the provision of basic social and economic infrastructure services. The third essay tries to examine these hypotheses and finds empirical evidence of developmental outcomes of reorganization of states.

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CHAPTER 2: RISK PREFERENCES AND CLIMATE SMART TECHNOLOGY ADOPTION: A DURATION MODEL APPROACH FOR INDIA

2.1. Introduction

Climate change is one of the biggest challenges of the 21st century. It has already caused observable negative effects on the environment and it is further expected to have widespread impacts on human and natural systems around the world. Sea levels have risen, observed temperature have increased and precipitation has become more erratic across the globe leading to a myriad of new problems. As agriculture is heavily dependent on weather conditions in most parts of the world, changes in temperature and precipitation regimes due to changing climate is expected to impact agriculture disproportionately more than other fields of study (IPCC 2014). In many regions, agricultural production is already being adversely affected by: rising temperatures, increased variability in temperature, changes in levels and frequency of precipitation, greater frequency of droughts, and the increasing intensity of extreme weather events. As impact of climate change on agriculture intensify, it will become increasingly difficult to grow crops in the same ways and in the same places as we have done in the past. A variety of climate smart technologies and practices are being developed to help farmers cope with the adverse effects of changing climate. These new technologies have three main objectives: sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing and/or removing greenhouse gas emissions, where possible. In this paper we study the adoption of one such climate smart technology--Laser Land Leveler (LLL) in the Indian states of Punjab and Haryana.

LLL uses laser guided beams to level the fields with higher precision compared to traditional levelling. The technology helps reduce water use and increases crop yield that helps farmers adapt to changing climate (Kaur 2012). Furthermore, LLL saves fuel used for irrigation and indirectly reduces carbon emissions to help mitigate climate change. As LLL increases yield and reduces irrigation cost it is first order stochastically dominant over traditional leveling. For a region preoccupied with increasing yields and with rapidly declining stock of groundwater, this technology seems an appropriate choice for most farmers. Unfortunately, even after 15 years since its introduction, the technology has not been adopted by a significant population of farmers. Given such promising prospects one must ask why hasn't this technology yet been fully adopted in this region? What are the underlying factors for adoption or non-adoption of this technology in this region? These questions are the focus of this study.

Technological innovation has always been a major driver of economic development. More particularly, advances in agricultural technologies have been considered as a major factor in improving living standards of rural population. Given the much-advocated benefits from new agricultural technologies, the delay in adoption of proven technologies has always puzzled economists. An extensive literature exists that explain why farmers do not adopt or delay adoption of new technology. Much of this literature cites low level of education (Foster and Rosenzweig, 1995), lack of information and access to credit (Barrett et al., 2004), learning spillovers (Munshi, 2004), tenure insecurity, small farm size, and unreliable supply of complementary inputs as the main constraints to technology adoption. Furthermore, there has been significant enquiry on the role of uncertainty about the effectiveness of a new technology as a major constraint to adoption (Feder, 1980). In most developing countries, agriculture is considered a risky proposition given its dependence on environmental factors that are beyond farmers' control. Moreover, any new agricultural technology can have a wide distribution of outcomes, increasing the associated uncertainty. Thus, any new agricultural technology is inherently perceived as an uncertain proposition. Consequently, farmers' perceived uncertainty regarding the effectiveness of the technology allows individual subjective risk preferences to play a major role in technology adoption (Holden, 2015).

In this paper we use the time duration from the introduction of LLL in India to farmers' awareness and adoption of LLL to analyze how risk attitudes affect technology adoption decisions. Most new technologies promise higher yield but also increase the associated risk, often leading to low adoption by risk averse farmers. However, LLL being a climate smart technology comes with a scientific assertion that it would increase yield, lower cost of irrigation and is considered less risky than the traditional leveling in terms of yield risk. Despite the promising scientific claims, ex ante we do not know whether farmers would consider this technology as more or less risky than the traditional leveling technology. For farmers this is like any other new technology and their subjective beliefs about the success of the scientific claims about the technology and their risk preferences play a major role in their adoption decision. It is likely that if the farmers consider LLL as risky, then like most other new technologies, risk loving farmers are more likely to adopt it sooner. However, if the farmers consider it risk reducing then farmers who are risk averse are likely to adopt it sooner. This makes risk preferences an important factor in adoption decision.

Risk preferences have long been recognized as an important factor in explaining technology adoption. There are multiple reasons why it is important to account for individual risk preferences when studying technology adoption. First, omission of risk preferences is likely to bias significant variables like education and wealth, which are correlated with risk (Lybertt,T.

Just,D.R. 2007). Second, individual risk preferences have shown to be defining wealth accumulation and income growth (McInish, Ramaswami, and Srivastava, 1993). Third, Dohmen (2012) finds intergenerational correlation in risk preferences, which could explain the low level of intergenerational income mobility and wealth accumulation. The degree to which they play a role in wealth accumulation is less understood from an empirical perspective.

The common approach to illustrate an individual's risk attitudes is to use expected utility theory (EUT) approach where the curvature of the utility function is solely defined by risk aversion. We relax some of these restrictive assumptions inherent in EUT by incorporating aspects of prospect theory (PT) where the utility function is jointly defined by risk aversion, loss aversion, and non-linear probability weighting measure. While loss aversion measures one's sensitivity to losses as compared to gains, non-linear probability weighting measure captures individual's tendency of overvaluing small probabilities and undervaluing large probabilities. We believe that PT might explain individual decision-making better than EUT, as it captures loss aversion and non-linear probability weighting measure and is therefore more likely to simulate a real-life decision making involving risk.

We develop a simple technology adoption model that includes risk preferences. Considering uncertainty regarding LLL as a major inhibiting factor for its adoption, we allow subjective risk preferences of the farmers to be different from the objective risk. It is likely that the subjective risk of the farmers regarding its effectiveness in reducing irrigation cost and increasing yield is different from objective risk associated with the technology. The model assumes that subjective beliefs of the farmers about the effectiveness of LLL in reducing water use for irrigation and their subjective belief of future rainfall will determine their adoption decision. As this technology is risk reducing, the model predicts that if the farmers perceive LLL as more effective in reducing water cost and increase yield as claimed by the scientists, then more risk averse farmers would adopt it sooner. Alternatively, if the farmers considered this technology as not very effective in reducing water cost and increasing yield then they would delay adoption.

This paper is organized as follows. Section 2 covers the literature review. Section 3 provides information on the laser land leveler technology and describes the survey and dataset. Section 4 explains the design of the field experiment and presents descriptive analysis. In Section 5 a conceptual framework is used to describe the role of risk preferences in technology adoption decisions. Section 6 provides a general econometric framework to test the predictions and describes the empirical results. Section 7 concludes the paper.

2.2. Literature Review

Adoption of technological innovations in agriculture has attracted considerable attention among development economists because livelihood of majority of the populations in developing countries revolves around agriculture. There is growing consensus among economists believing that adoption of new technologies seems to offer an opportunity to increase production and income substantially (Foster,A.D, Rosenweig, M.R, 1996). But the introduction of many new technologies has met with only partial success resulting in low rates of adoption. A series of studies tried to investigate the reasons for low adoption and farm size was one of first factors examined by the empirical literature on adoption. Farm size can have different effects on the rate of adoption depending on the characteristics of the technology and institutional setting. The literature suggests that large fixed costs reduce the tendency to adopt and slow the rate of adoption by smaller farms (Weil,1970). Several studies reviewed by Binswanger (1978) found a strong positive relationship between farm size and adoption of tractor power in south Asia. Other empirical studies have shown that inadequate farm size also impedes an efficient utilization and adoption of certain types of irrigation equipment such as pumps and tube wells (Hodgdon and Singh 1966; Dobbs and Foster 1972; Gafsi and Roe 1979).

Education and labor availability have been considered as important determinants of adoption of agricultural technology. Education as defined by formal schooling is hypothesized to play an important role in determining allocative ability than worker ability (Welch 1970). This hypothesis has been supported by several studies; Ram (1980) found that farm operators' contributions to production are positively related to their education, whereas workers' contributions are not. Sidhu (1976) found that although farmers' education has some effect on yield, it had relatively greater effect on gross sales by farmers in the early stages of the Green Revolution in the Punjab. These studies suggest that farmers with better education are early adopters of modern technologies and apply modern inputs more efficiently throughout the adoption process. Labor availability is another important focus of the technology adoption literature. Some new technologies are relatively labor-saving, and others are labor using, which means the local labor availability dictates which technologies are adopted and which are not. Hicks and Johnson (1974) found that higher rural labor supply leads to greater adoption of labor-intensive rice varieties in Taiwan, and Harriss (1972) has found that shortages of family labor explain non-adoption of HYVs in India.

Credit constraint among small farmers is another topic studied extensively as a limiting factor for technology adoption. Access to capital is required to finance many new agricultural technologies, thus differential access to capital explains differential rates of adoption. Lack of capital or access to credit becomes a bigger problem when the technology is indivisible like tractor and requires a very large initial investment (Lipton 1976; Bhalla & Alagh 1979). However, there are many studies which suggest that credit constraints do significantly limit adoption of even divisible technologies like HYV or fertilizer where the fixed pecuniary costs are not large (Frankel 1969; Wills 1972; Khan 1975).

There is a general scarcity of empirical studies that have addressed the role of risk and uncertainty in adoption. Feder (1985) in this early review of the literature on adoption attributed this to lack of adequate methods to measure risk preferences. Since then, there have been a few studies using multiple methods to elicit risk preferences of farmers. Even fewer studies of risk and adoption have used direct interview techniques to investigate the effect of farmers' risk attitudes and perception of riskiness of enterprises on their allocative decisions (Binswanger, 1980; O'Mara, 1983; Lindner and Gibbs, 1990; Smale et al., 1994; ; Marra et al, 2003).

Binswanger et al. (1980) were one of the first to elicit the risk preferences of a sample of Indian farmers using several elicitation techniques, including a gambling game with real money. Their method measured farmer's risk aversion, which was used as an explanatory factor in regression for adoption. Their results showed mixed results and were inconclusive about the role of risk aversion on adoption. Byerlee and Polanco (1986) used farm survey data from Mexico to analyze the step wise adoption of components of packages and practices. They found that adoption of each innovation was explained primarily by profitability and riskiness. Kebede (1992) found that risk aversion played a significant role in the adoption of new technologies among Ethiopian farmers. He found that income, farm size, education, family labor and experience were negatively related to risk-taking behavior in farming areas where off-farm income diversification opportunities existed. However, these factors were found to have the opposite effect in areas where farming was the only source of income.

Marra and Carlson (1990) studied the role of relative risk and risk aversion on the allocation of acreage between full-season soybeans and double-cropped wheat/soybeans in the southeastern US. They used expected utility framework along with covariance decomposition to estimate Arrow-Pratt risk aversion coefficients without assuming a functional form of utility function. They found relative riskiness of the two production technologies and risk aversion explained the aggregate decision to double crop. Further, Shapiro et al. (1992) used a tobit model to explain the effect of risk aversion on adoption of double cropping in the US. They elicited farmers' perception of riskiness of enterprises by asking them to construct frequency distributions using the fixed interval approach. They found that adopters were, on average, more risk averse than non-adopters. However, differences in their risk perceptions were more important than their risk preferences in explaining adoption.

Smale et al. (1994) conducted a study with Malawian maize growers on the role of risk preferences in the adoption of new seed varieties. They found that farmers' perception of the relative riskiness of new seed varieties influenced their adoption and intensity of cultivation decisions. The study elicited subjective yield distribution from individual farmers for the different varieties of maize to calculate relative riskiness estimates. Ghadim. et.al. (2000) conducted a more comprehensive study collecting 3-year series information on farmer's actual and planned adoption behavior for a new crop type, chickpeas in Australia. They calculated Arrow-Pratt coefficient of risk aversion based on a set of questions on hedging.

Most of the studies mentioned above use a limited definition of risk preferences as defined under expected utility theory (EUT) framework. Under EUT, the shape of the utility function is solely defined by risk aversion. However, there is a growing literature suggesting that expected utility theory does not provide a plausible theory of risk aversion for both small-stakes and large-stakes gambles and this decision theory should be replaced with an alternative theory characterized by loss aversion and non-linear probability weighting measure (Cox and Vjollca, 2001, Rabin 2000). Kahneman and Tversky (1979) in their seminal work developed Prospect Theory (PT) as an alternate model to describe decision making under risk, in which value is assigned to gains and losses rather than to final assets, and probabilities are replaced by decision weights. As PT allows for more flexibility and seems to be closer to actual decision making under risk, we use this framework to explain risk preferences of farmers. In choosing PT we do not reject EUT completely, as the latter is a special case in PT when loss aversion is same as risk aversion and non-liner probability weighting measure does not matter. Using PT, we do a comprehensive testing of roles of risk aversion, loss aversion and probability weighted measure in technology adoption decision for LLL.

Recently two papers Liu (2013) and Ward & Singh (2015) comprehensively assess the relevance of EUT and PT for adoption of new types of seeds. In a study of adoption of BT cotton seeds in China, Liu (2013) found that more risk averse and loss averse farmers adopt the BT cotton seed later, while farmers who overweighed smaller probabilities adopted the seeds earlier. Ward and Singh (2015) conducted a similar study on the adoption of drought tolerant paddy in India and found that risk averse and loss averse farmers are more likely to switch to new rice seeds, which outperform other cultivars under moderate and severe drought conditions. Both these studies clearly show how loss aversion and probability weighting measure is an important parameter, along with risk aversion in defining technology adoption. Building on their work, this paper also uses all three risk parameters in explaining technology adoption decision. To our knowledge, this is the first study that examines the role of risk preference in explaining the adoption of a climate smart technology, which is considered to be and promoted as risk reducing among scientific and development community.

2.3. Background on Laser Land Leveler and the Technology Adoption Survey:

2.3.1 Background on Laser Land Leveler

This paper analyzes the adoption of LLL in rice-wheat cropping systems in India. Rice–wheat (RW) is the most important cropping system for food security in South Asia with 13.5 M ha of land devoted to this farming system and providing food for more than 400 million people. In India, the rice-wheat cropping system contributes 26% of total cereal production and 60% of total calorie intake (Gupta et al., 2003). The area under the RW system is static and the productivity and sustainability of the system are threatened, because of the inefficiency of current production practices, shortage of resources such as water and labor, and demographic changes. Pressure is increasing on the limited land, water and increasing variability in the climatic factors are increasingly making it difficult to meet the increasing demand for food for the burgeoning population.

To address the dual need of ensuring food security and mitigating the effects of climate change, research program on Climate Change, Agriculture and Food Security (CCAFS) of the Consultative Group on International Agricultural Research (CGIAR), in partnership with the

Indian agricultural research centers and other agencies have introduced an array of technologies and practices under the rubric of climate-smart agriculture (CSA) in India. LLL is one of the technologies promoted by CGIAR, with a claim to equip farmers to adapt to changing weather patterns amidst depleting ground water resources. LLL has been around for a while in developed countries but was introduced in India in the last decade with a specific aim to reduce irrigation water usage.

Traditionally, farmers in India level their land after ploughing and before sowing to allow flood irrigation water to evenly spread across the field. Conventionally, farmers in India use plankers drawn by draft animals or by small tractors for land leveling. In the states of Punjab and Haryana farmers mostly use iron scrappers or leveling boards connected to 4- wheel tractors. Traditional land leveling includes field survey, staking and designing the field, calculation of cuts and fills and then using a scraper and a land plan to even the land. Despite all these labor-intensive efforts, desired accuracy is not achieved. These leveling practices are crude and do not achieve a precise land leveling leading to less input use efficiencies and low yield at the cost of more water. Laser land leveling solves this problem by meeting the objectives of achieving a better crop stand, saving irrigation water and improving the input use efficiencies. LLL is a machine equipped with a laser-operated drag bucket that ensures more flat, even surface in less time compared to the traditional scraper (Appendix-4). A more even land means irrigation water reaches every part of the field with minimal waste from water run-off or water-logging. This ensures that farmers use water more efficiently while reducing the labor in irrigation. It also reduces potential nutrient loss through improved runoff control, leading to greater efficiency of fertilizer use and higher yields. Use of laser land leveler reduces emission of greenhouse gases through decreased water pumping time, decreased cultivation time and better use of fertilizers (Aryal et al. 2015).

Success of LLL in the Indian context has been well documented in a paper by Jat et al. (2009) where they show that LLL improves rice-wheat (RW) cropping-system productivity by 7.4% as compared to traditional land leveling. Total irrigation water savings under LLL versus traditional leveling were estimated to be 12–14% in rice and 10–13% in wheat. LLL improved per hectare profitability of the RW cropping-system from US$113 to $175 (Jat et al 2009). The technology is well suited for smallholder farmers as it does not require any major investment. Cost of a new LLL is close to $4,000, which is quite high for small farmers in India, so this technology is mostly bought by large farmers who in turn rent it out to other farmers. In our sample almost all the farmers using LLL rented it for a nominal charge equivalent to a few days of rural wages, which is quite affordable. The learning curve for farmers to use this technology is not very steep as the method of traditional leveling is very similar to LLL. Further, the operators of the LLL usually guide farmers about its usage making it easy for them. Given these superior characteristics and success of LLL in field trial by agronomists, it is quite puzzling to see that a significant proportion of farmers have still not adopted this technology. In conversation with experts prior to the field survey and in the pilot survey, we found that uncertainty about the technology was one of the main reasons farmers delayed the adoption of what seems likes an obvious choice of technology.

2.3.2 Survey Procedure

The risk experiments were designed by the authors and conducted as part of larger representative adoption surveys. These surveys were conducted in several districts in India to assess the adoption of LLL and other natural resource management technologies, namely direct seeded rice and zero tillage. However we did not find much adoption of either zero tillage or direct seeded rice in these regions and therefore focused only on laser land leveler. The two districts focused in this study are—Ludhiana in Punjab with a population of approximately 3.5 million, and Karnal in Haryana with a population of 1.5 million as shown in appendix 3. These districts fall under the rice-wheat cropping system and are considered to be most developed agriculturally in their respective states and the entire country. Over time there has been a series of interventions by various CGIAR institutions (especially, CIMMYT under the CCAFS program) and the state governments to introduce climate smart technologies, including the LLL in these two districts.

Both the districts included in the study have national or state level agricultural universities. While Ludhiana has one of the most prominent state agricultural universities of India (Punjab Agricultural University), Karnal is home of the Indian Institute for Wheat and Barley Research of the Indian Council of Agricultural Research (ICAR). In summary, these two districts have always had new agricultural technologies available and historically have led the country in terms of technology diffusion and adoption.

For the broader adoption study, in each study districts 80 villages were randomly selected from a list of all wheat growing villages using the probability proportionate to size (PPS) method (where size was measured by net sown area in the village as obtained from the last Census data). In each of these villages 10 households were selected randomly by the enumerators and a detailed questionnaire was administered to collect data on farmer and household characteristics, technology specific data for LLL, adoption of other technologies by the household, and farmers' perception on constraints in wheat and rice farming. Data was collected from September to November 2015 using a Computer Assisted Personal Interview (CAPI) method from a total of 1600 households across the two districts. The risk experiments were conducted on a sub-set of villages included in this larger study. The total sample size of households subjected to risk experiments include 201 households in Karnal and 231 households in Ludhiana. Agricultural data collected in these surveys corresponded to Rabi 2014-15 and Kharif 2015 agricultural season. Prior to conducting the experiment, enumerators explained the set of standardized instructions and asked questions to confirm whether the farmers understood the experiment. Next, before the real experiment, two rounds of practice experiments were conducted without cash, but with candies as the payoff outcomes to make sure the farmers understood the rules of the game.

2.3.3 Data Description

Figure 1 shows the distribution of risk aversion, loss aversion and non-linear probability weighting measure. The lowest value for risk aversion is 0.05 and the highest value is 1.5 with majority of the values lying between 0.05 and 1, suggesting that most of the farmers in our sample are risk averse. For non-linear probability weighting measure the lowest value was 0.05 and the highest was 1.45, with most values under 1 suggesting that at an average farmer overvalue smaller probabilities of high impact events. Most of the loss aversion values are above 1 suggesting farmers consider losses differently than gains.

Table 1 shows the summary statistics for the variables of interest for the households that participated in the experiments. The average farmer is around 42 years old at the time of the survey and has 9.43 years of formal education. This is expected as the study districts are in an advanced part of India and farmers are likely to be more educated. The farmers are well to do in this region with an average land holding of 9.43 acres (3.7 hectares) and the average household poverty score on a scale of 0-100 is close to 67, which implies less than 10% probability that a typical household included in our survey is living below poverty line. The average household size is 5.95 and the average number of working members is 2.44, which is typical for rural India. From the total 481 households, 432 households or close to 90% had heard about the Laser Land Leveler technology, and of these 432, 67% had adopted it. For explaining time to adoption, we use this sample of 432 households who had heard about the technology by the time the survey was conducted.

2.4. Field Experiment Design and Procedure

2.4.1 Experiment Design

We use a variant of the Multiple List Price (MPL) method (Miller 1969) to elicit the risk preference of Indian farmers. The MPL offers choices between two or more uncertain prospects with fixed amount and varying probabilities. In the widely-used Holt and Laury (2002) version of MPL, subjects face a single list of binary decisions between two gambles. The payoffs remain the same in each decision but the probabilities vary, meaning that any respondent with consistent risk preferences should have a “switch” point between preferring gamble A or gamble B. Tanaka, Camerer and Nyugen (2009, hereafter TCN) offers a new variant of MPL in which the probabilities remain same and the payoff increases in one of the gambles to find at what payoff (if they ever switch) the participant switches from a less risky gamble to a high risk-high payoff gamble. This variant of the MPL also incorporates PT by eliciting loss aversion and non-linear probability weighting measure along with risk aversion. Ex ante, both PT and EUT can act as a potential theory explaining farmer’s decision making regarding this new technology. However, prior to the study it was not clear which one would explain farmer’s behavior better. We therefore use TCN design as it allows us to estimate empirical specifications with the flexibility to incorporate both PT and EUT. Further, TCN design has been tested in Vietnam, China (Liu, 2013) and India (Ward and Singh, 2015) with less educated farmers and it was simple enough to understand by farmers in Indian states of Punjab and Haryana.

Following the TCN procedure the following utility function form is assumed.

$$U(x,p;y,q) = \begin{cases} v(y) + w(p)\big(v(x) - v(y)\big) & if \quad x > y > 0 \text{ or } x < y < 0 \quad (1) \\ w(p)v(x) + w(q)v(y) & if \quad x < 0 < y \quad (2) \end{cases}$$

Where

$$v(x) = \begin{cases} x^{\sigma} & for \quad x > 0 \\ -\lambda(-x^{\sigma}) & for \quad x < 0 \end{cases}$$

and $w(p) = exp[-(-lnp)^{\alpha}]$, $for\ 0<\alpha \leq 1$

In the above utility function, *x and y* are the outcomes and *p and q* are the probabilities associated with these outcomes. Parameter σ describes the curvature of the value function above zero. For a risk averse individual $\sigma < 1$, for a risk neutral individual $\sigma = 1$ and for a risk loving individual $\sigma > 1$. Risk aversion decreases in σ, *i.e. as* σ *increases risk aversion decreases.* Parameter λ, is the loss aversion parameter, that defines the shape of the value function below zero comparative to the value function above zero. If $\lambda=1$ then there is no kink in the curvature of the value function around 0, suggesting that individuals treat losses like gains, however if $\lambda \neq 1$ indicates a kink. $\lambda>1$ implies a more convex shape of the value function below zero suggesting individuals are more averse to loses than to gains. The non-linear probability weighting measure α comes from an axiomatically derived weighting function model by Prelec (1998). α captures the degree to which less likely events are disproportionately weighted when valuing risky prospects. $w(p)$ shows the probability weighting function. $\alpha < 1$ suggests an inverted S shaped $w(p)$, indicating overweighting of low probabilities of larger losses or gains and underweighting of higher probabilities. If the estimated results give us $\alpha=1$ *and* $\lambda = 1$, then the above model reduces to EUT. However, our empirical results suggest that prospect theory captures the risk behavior of our sampled farmers better than EUT as suggested by table 2, supporting the application of prospect theory for the empirical analysis presented in this paper. The average risk aversion of sampled farmers is 0.64, the average value of loss aversion is 3.12 and the average value of probability weighting measure is 0.7, which are close to the findings in the studies conducted by Liu in China and Ward et al. in India working with farmers of similar profile.

2.4.2 Field Experiment Procedure

Prior to conducting the experiment, enumerators explained the set of standardized instructions and asked questions to confirm whether the farmers understood the experiment. Next, before the real experiment, a round of practice experiment was conducted with candies as the payoff outcomes. This was conducted to make sure the farmers understood the rules of the game and how to note down their choices. A detailed instruction sheet for the enumerators explaining the protocol for the risk game has been can be found in appendix 2. Appendix 5 shows some pictures of the actual games being played by farmers in the states of Punjab and Haryana.

To estimate the risk preference parameters (risk aversion coefficient, loss aversion coefficient and probability weighting measure), field experiments were conducted in the study area with a sample of farmers surveyed to measure the adoption of LLL. Field experiments involved playing lottery games with individual farmers (main decision maker of the household) who were selected for the adoption survey. Game participants were given three independent series of games that had a total of 35 pairwise choices. The first and second series contained 14 choices each and the third series had 7 choices between two lotteries: A and B. These two options (A and B) differ in the expected value of the lottery, which is a function of the probability of winning the noted cash value in a scenario of a random draw of a number between 1 to 10. Appendix 1 shows all the 35 pairwise options and represents entire game's payoff matrix.

For each of the 35 games (or rows in Appendix 1), respondents were presented with these two options and asked to select either Option A or Option B. For example, for series 1 (i.e., row 1) the respondents were presented with the options shown in figure 2.1. The figure shows the row 1 of series 1 of the lottery was presented to the individuals. Lottery A offers a 30% chance of receiving Rs.40 and 70% chance of receiving Rs.10, whereas lottery B offers a 10% chance of receiving Rs.68 and 90% chance of receiving Rs.5. This decision to select Option A or Option B was repeated for each of the 35 rows in Table 3.

In all three series (series 1, series 2 and series 3), option A is always less risky compared to Option B as suggested by the payoffs and the probabilities. For both series 1 and 2, the expected value of lottery A does not change but as we proceed down, the expected value of lottery B keeps monotonically increasing and eventually exceeds the expected value of lottery A (Table 3). We are interested in finding the "switching row" - row when the individual switches from a less risky option A to a more risky option B, for series 1 (rows 1 to 14), series 2 (rows 15-28), and series 3 (rows 29-35). As we go down the rows, the expected value of Option B keeps increasing and therefore a more risk averse individual would choose lottery A for a greater number of iterations before shifting to B, as compared to a risk neutral or risk loving individual.

Following TCN's procedure, the subject is assumed to be rational, therefore he is allowed to switch from lottery A to lottery B only once in each series. The enforcement of monotonic switching is a contentious issue with arguments on both sides. It is only rational to assume that if a subject chooses a risky option over a less risky option at lower expected value, he/she will choose a risky option over a less risky option when the payoff of the risky option increases resulting in no switching back. However, it is possible that enforcement causes subjects to choose the less risky options for more iterations before switching to the risky option as they cannot come back to less risky option after switching. We understand that there is no perfect solution to this and we ended up forcing a monotonic switching as it has worked fine with subjects of similar educational background in Tanaka et al. (2010), Liu (2013), and Ward and

Singh (2015). Furthermore, we had a smaller sample size and we were concerned about not being able to interpret inconsistent observation from the analysis in case many participants switched back to option A after once switching to option B. Also, the option of never switching is also available for each of the series. For example, a subject is free to choose lottery A for all 14 or 7 questions in any/all of the series or he can choose lottery B for all the rows for any/all of the series.

Individuals were told that one of the 35 rounds will be randomly chosen ex post and the lottery chosen will be played for actual cash. With this information, the individuals were asked to choose between option A and option B for all the 35 rows. Once they completed their selection, there was a random draw of 35 numbered plastic chips to decide which game was played for real money. Once the game number (1 to 35) was selected, the next step was to select a random number between 1 to 10. For this the TCN method was followed by putting 10 numbered wooden chips (each numbered 1 to 10) in an opaque bag and then asking the farmer to draw one chip out of it to complete the randomization. For example, if the subject draws plastic chip number 1, and he has chosen lottery B for row 1, and a wooden chip number 7 is randomly drawn, he would earn Rs.5. However, if he chose lottery A for the same row, and number 7 is drawn, then he would earn Rs.10.

Switching points in each of the three series in Table 3 are used for identifying the underlying behavioral parameters. The estimates of risk aversion coefficient (σ - that determines curvature of the utility function in the positive domain) and non-linear probability weighting measure (α) are simultaneously determined by the switching rounds in series 1 and series 2. These two series are carefully designed so that the pair of switching rounds from the two series can be used to identify the range for both σ and α, that are consistent with PT.

Series 3 has both positive and negative payoffs. It has seven choice scenarios, each of which comprise of two lotteries like earlier series. In each of the lottery there is a positive and a negative payout. The payouts vary across rows and are specified in a way that enables estimation of a range of possible loss aversion coefficient for each respondent.

The loss aversion parameter λ is determined by the switching point in series 3 and series 1. Notice that λ cannot be uniquely determined from switching point in series 3 alone. Payoffs in series 3 are designed to make sure that λ takes similar values across different levels of σ. In calculating the λ, the probability weighting measure α drops out as the probability of getting positive or negative payoff are equivalent in each round (p=0.5, q=0.5) and therefore the payoffs in series 3 must only correspond to different values of σ.

Since it would be unethical and impossible to have participating farmers pay from their own pocket, in case they lose money in the lottery, Rs.21 was given to each of the participating farmer at the beginning of the game. This was the maximum amount a subject can lose in the worst-case scenario. This also gave the farmer an ownership over the Rs. 21 and could better elicit the loss aversion behavior as now, it was his endowment that he was betting on. We find average of σ as 0.64 suggesting farmers in the sample in general are risk averse. The average of α = 0.70 implying farmers seems to overvalue smaller probabilities of high impact gains/losses. The average of λ = 3.13, indicating a kink in the values function around 0, with steeper declines in prospect value in the loss compared to the inclines under gains. All three risk parameter average values are close to values found in other studies done by Liu in China and Ward in Eastern India.

2.4.3 Estimation of Parameters

For any participant who switches at row N, we can conclude that he prefers lottery A over B till row N-1 and at row N he prefers lottery B over lottery A. So, we can get two sets of inequalities from this switching point. Using a combination of switching points from series 1 and series 2, yields a range of α and σ that satisfy this pair of inequalities.

For example, suppose someone switches from lottery A to lottery B in row 7th in series 1. This means he preferred lottery A to lottery B till row 6th and he prefers lottery B to lottery A in row 7th). Then the following inequalities must be satisfied.

$$10^{\sigma} + \exp[-(-ln0.3)^{\alpha}]\,(40^{\sigma} - 10^{\sigma}) \quad > \quad 5^{\sigma} + \exp[-(-ln0.1)^{\alpha}](125^{\sigma} - 5^{\sigma}) \tag{3}$$

$$10^{\sigma} + \exp[-(-ln0.3)^{\alpha}]\,(40^{\sigma} - 10^{\sigma}) \quad < \quad 5^{\sigma} + \exp[-(-ln0.1)^{\alpha}]\,(150^{\sigma} - 5^{\sigma}) \tag{4}$$

Solving the above equations, we do not get point estimates but range values for σ and α. For example, one of the values for the (σ, α) combinations is $0.36 < \sigma < 0.44$ and $0.36 < \alpha < 0.44$. Following the TCN's convention we approximate the value of σ and α by taking the midpoint of the interval to one decimal place to get the above (σ, α) combinations as (0.4, 0.4). Using the midpoint estimates, the (σ, α) combinations that satisfy the above inequalities are (0.4,0.4), (0.5,0.5), (0.6.0.6), (0.7,0.7), (0.8,0.8), (0.9,0.9) or (1,1).

Similarly, if the same person switches from A to B in row 7th in series 2, the following inequalities holds true

$$30^{\sigma} + \exp[-(-ln0.9)^{\alpha}]\,(40^{\sigma} - 30^{\sigma}) \quad > \quad 5^{\sigma} + \exp[-(-ln0.3)^{\alpha}](65^{\sigma} - 5^{\sigma})$$

$$30^{\sigma} + \exp[-(-ln0.3)^{\alpha}]\,(40^{\sigma} - 30^{\sigma}) \quad < \quad 5^{\sigma} + \exp[-(-ln0.3)^{\alpha}](68^{\sigma} - 5^{\sigma})$$

The (σ, α) combinations that satisfy the above inequalities are (0.8, 0.6), (0.7, 0.7), (0.6, 0.8), (0.5, 0.9) or (0.4, 1). By intersecting the parameters ranges from series 1 and series 2, we can obtain the approximate values of (σ, α) = (0.7, 0.7). Note that λ cannot be uniquely determined from switching in series 3. Payoffs in series 3 were designed to make sure that λ takes similar values across different levels of σ, which means for each switching point in series 3, we will have different values of λ based on the earlier found value of σ for that individual. In this series the positive and negative payouts vary from round to round, but are specified in such a way that enables estimation of a range of possible loss aversion coefficients. For each of the two lotteries, the probabilities of 'winning' and 'losing' are equivalent(p=q=0.5), so the probability weighting function applied to both 'winning' and 'losing' payouts in each of the lotteries is the same, and further drops out when calculating the loss aversion parameter for a particular switching round.

2.5. Conceptual Model

This section presents a simple conceptual framework explaining the role of risk preference parameters in technology adoption decision. We have two lotteries; L^T, which represents the lottery under traditional farming methods and L^L, which represents the lottery under laser land leveler. As farmer has been using the traditional leveling technology for long, we consider that the only source of uncertainty in this case comes from the uncertainty in rainfall growing their crops every year as explained in the model below. Suppose there are two states of nature--a good monsoon year where the rainfall is adequate and a bad monsoon year where the rainfall is less than adequate leading to higher cost of irrigation. Let us consider that the good state of nature happens with a probability of q and the bad state of nature occurs with a probability of 1-q. Given The above probabilities, the lottery under traditional farming is following.

$$L^T = \begin{cases} 1 - I \text{ that represents a good year with a probability of } q & (5) \\ 1 - a\, I \text{ that represents a bad year with a probability of } (1-q) & (6) \end{cases}$$

Where 1= normalized revenue per hectare.

I= cost of all inputs including irrigation cost.

a= extra input cost as a proportion due to a bad monsoon year, due to increase in irrigation and labor cost. a>1.

For laser land leveler there are two sources of uncertainty. First the uncertainty due to rainfall. Second, the uncertainty due to farmer's belief about the success of the technology. In this case we assume farmer believes that the technology is successful with a probability of p and it fails with a probability of 1—p. Given both these sources of uncertainty the farmer decides under the following lottery.

$$L^L = \begin{cases} X - s_1 I - c \text{ good monsoon and technology} \\ \text{succeeds with probability of } pq \text{ ----------- } (7) \\ X - s_2 I - c \text{ bad monsoon and technology} \\ \text{succeeds with probability of } p(1-q) \text{ -------- } (8) \\ 1 - I - c \text{ good monsoon and technology} \\ \text{fails with probability of } (1-p)q \text{ ----------- } (9) \\ 1 - a\, I - c \text{ bad monsoon and technology} \\ \text{fails with probability of } (1-p)(1-q) \text{ -------- } (10) \end{cases}$$

where

X= Higher proportion in revenue due to increased yield by the use of LLL.

s_1= saving of irrigation cost as a proportion due to use of LLL in a good monsoon year. s_1< 1.

s_2= saving of irrigation cost as a proportion due to use of LLL in a bad monsoon year. s_2< 1.

Smaller s means more saving and as this is water saving technology $s_2 < s_1 < 1$

c= cost of hiring LLL per hectare.

In conversation with agricultural experts and farmers we got a sense that failure of the technology was generally not a source of uncertainty for the farmers in case of LLL. Most farmers believe that LLL is a successful technology unlike other less tested technologies. This was further substantiated in our data that suggested that only 7 out of 432 farmers ever dis-adopted LLL after having used it once. The evidence suggests that farmers do not have much doubt about the success of LLL. To incorporate this information, we simplified out conceptual model allowing only for uncertainty due to rainfall as shown below.

$$L^L = \begin{cases} X - s_1 I - c \;\; in\ a\ good\ monsoon\ year\ with\ a\ probability\ of\ q & ----(11) \\ X - s_2 aI - c \;\; in\ a\ bad\ monsoon\ year\ with\ a\ probability\ of\ 1-q & --- (12) \end{cases}$$

In this case, we consider input cost as a function of labor wages, because most pumps here are electricity based and electricity for farmers in the state of Punjab is free while it is heavily subsidized in Haryana. So, the extra cost of irrigation come from extra labor cost farmers need for irrigation. However, this model can be used as a generic case, where irrigation cost is a function of multiple other factors.

Now we plug the lotteries in the functional form of the utility function (as shown above) is as follows

The utility function for traditional lottery is $U(L)^T$

$$U(L)^T = w(q)\ v(1-\ I) + w(1-q)\ v(1-a\,I) = \exp[-\,(-lnq)^{\alpha}]\,(1-\ I)^{(\sigma)} -$$

$$\lambda\,\exp[-\,(-\ln(1-q))^{\alpha}]\,(1-a\,I)^{(\sigma)}$$

and utility function for the lottery under laser land leveler $U(L)^L$

$$U(L)^L = \exp[-\,(-lnq)^{\alpha}]\,(X - s_1 I - c\,) - \lambda\,\exp[-\,(-\ln(1-q))^{\alpha}]\ (X - s_1 I - c)^{(\sigma)}$$

We define the probability of adoption as a function of difference in the two utilities

As Prob $(L)^L$ =f ($U(L)^L - U(L)^T$)

Plugging in the functional form of both the utility functions we get

$$\Pr\,(L)^L = \exp[-\,(-lnq)^{\alpha}]\,(X - s_1 I - c\,) - \lambda\ \exp[-\,(-\ln(1-q))^{\alpha}]\ (X - s_1 I - c)^{(\sigma)} -$$

$$\exp[-\,(-lnq)^{\alpha}]\,(1-\ I)^{(\sigma)} +\ \lambda\,\exp[-\,(-\ln(1-q))^{\alpha}]\,(1-a\,I)^{(\sigma)}$$

Next, we define Pr $(L)^L$ = F and take derivate of the function wrt risk aversion coefficient, loss aversion coefficient and probability weighting measure to know how does different risk measures affect adoption.

Plugging the values of c, a, f(w), p and q from empirical data and the average values of risk version coefficient (σ), loss aversion coefficient (λ) and probability weighting measure (α) we have following predictions from this model:

$\frac{dF}{d\sigma}$ = -ve   i.e. More risk averse farmers are more likely to adopt earlier than risk neutral or risk loving farmers. This falls in line with the risk-reducing idea associated with these climate smart technologies; a lower σ means higher risk aversion which causes higher adoption. Alternatively, higher risk aversion means higher likelihood of early technology adoption.

$\frac{dF}{d\alpha}$ = -ve i.e. Farmers who overvalues smaller probabilities are more likely to adopt. A smaller α means the farmer overvalues smaller probabilities of big gains/losses. So a farmer who overvalues smaller probabilities is more likely to adopt faster than farmers who does not.

We test these theoretical findings with empirical data in the later sections to see if they hold true in the case of LLL technology adoption in the study area.

2.6. Econometric Framework and Results

2.6.1 Econometric Framework

In this section, the main decision variable of interest is the time to adoption. Since, we have the retrospective data on the year of release (i.e., 2001), year when the farmers became aware about the technology, and the year farmers adopted it, duration model provides a suitable framework for modeling adoption probabilities (Kiefer, 1988). Most studies using duration analysis to model time to adoption, use the release of the technology as the base year and assume that there is no heterogeneity in information dissemination of the technology. Estimating such single duration of adoption without accounting for diffusion duration raises econometric issues such as endogeneity (Ahsanuzzaman and Maredia, 2018). A farmer who has endogenously better access to information, say who is leader of a group, is expected to be aware of the technology earlier than other farmers. This, however, does not necessarily indicate that the same farmer is more likely to adopt the technology earlier than the other farmers.

Suppose a technology is released in the year 2010 and a farmer gets to know about it in the same year (2010) and waits for 6 years to finally adopt it in 2016. Compare this farmer to another farmer who gets to know about the technology in 2014 and waits only 2 years to adopt it in 2016. Suppose we conduct our survey in the year 2016 and find both of them to have adopted the technology, we would model both of them as same leading to endogenous estimates. While estimating adoption duration, the omission of diffusion time might be due to unavailability of the information about the diffusion duration. However, we have data on both the duration of diffusion (time it took for farmer to know about LLL) and adoption duration (time it took to adopt once the farmer got to know about it). We model the later duration as this is the period when the farmer is actually exposed to the technology.

Let *t* be the time elapsed from the time of first exposure to Laser Land leveler adoption, $X_i(t)$ be a vector of relevant explanatory variables, and β be a vector of coefficients. Denoting the cumulative density function as $F_i(t|X_i, \beta) = Prob(T \leq t|X_i, \beta)$ and the density function as $f_i\,(t\,|\,X_i\,, \beta)$. The hazard function indicating the probability of adopting LLL at period t conditional on not having adopted it till time *(t-1)* is defined by $h_i\,(t\,|X_i\,, \beta\,) = f_i\,(t\,|\,X_i\,, \beta\,)/[1 - F_i(t|X_i, \beta)]$.

The general form of proportional hazard function is

$$h_i(t|X_i(t), \beta) = h_0(t)\exp\{X_i'(t)\beta$$

Where h_0 is the baseline hazard and X's are the explanatory variables. I use a Weibull baseline hazard specification to test if the hazard is time dependent. For more intuitively interpretable results, the above hazard rate can be parameterized into what is known as the Accelerated Failure Time (AFT) model, a simple transformation of the proportional hazards model, which is what we use. Under AFT we take exponential of the β to interpret the coefficients. In vector form, the AFT model can be expressed as

$$\log(t)=\beta' X + \sigma\varepsilon$$

where t is a non-negative random variable denoting adoption time, X is the vector of explanatory variables, and β is the vector of corresponding coe□cients. In the case of a Weibull hazard function, ε is the error term that follows an extreme value distribution.

2.6.2 Results

Table 4 presents the Probit results of binary adoption decision. As risk aversion goes down in risk aversion coefficient. A negative coefficient for risk aversion coefficient suggests higher adoption for farmers who are risk averse. Similarly, a negative coefficient for probability weighting measure suggest that farmers who overvalue smaller probabilities of high impact events are more likely to adopt this technology. However, as most experts believe that this technology will be widely adopted in this region and therefore adoption as a binary outcome variable does not provide rich information about the role of risk preferences in adoption. If majority of the farmers are eventually going to adopt this technology, time to adoption seems to provide more interesting information about the role risk preferences play in adoption decision. We focus primarily on the time to adoption in the result section.

The results of the estimates of the duration model for "exposure time" of LLL adoption is presented in Table 5. We model the exposure time as the time farmers took after they became aware about the technology. State and village fixed effects are controlled for in all specifications. The main characteristic of interest is individual risk preference parameters. In the existing literature, most studies do not have any control for individual risk preference; therefore, the regression result in Column 1 excludes the risk preferences parameter as a comparison. Column 2 shows results on time to adoption once the farmer is aware about the technology, and column 3 show results on time to adoption from release of the technology. It is apparent that the results from column 3 underestimate the effect of risk parameters due to missing information on time for diffusion. Column 2 results takes into consideration the temporal heterogeneity in diffusion and therefore correctly estimates the impact of risk preference on time to adoption.

To interpret the coefficients, one needs to exponentiate coefficients reported in table 5. For example, to interpret the coefficient of σ in Column 2, we need to exponentiate (0.188) = 1.21. This implies that the risk-averse individual with σ = 0 in the sample is 21% more likely to adopt Laser Land Leveler than the risk-neutral individual (σ = 1) at any given time. Similarly, an individual who overvalues smaller probability (α=0) is 20% more likely to adopt LLL at any given time (Exp[0.185]=1.20). α defines the shape of the probability weighting function and a smaller α indicates an individual's tendency to overweight small probabilities.

An increase in income from wheat-rice crops as a proportion of total income leads to higher probability of adoption. Age at the time of adoption and education both have negative coefficient but are not significant. Higher number of plots makes a farmer more likely to adopt the technology. This study does not have a detailed social network module like the one in Conley and Udry (2010), which can be a concern given that networks might be correlated with risk preference and social network is also correlated with technology adoption. We use self-reported proxies for network defined as ‘the number of farmers the respondent typically interacts with’ and the results clearly show that smaller the social network of the farmer, lower is his probability of adoption. We also, control for religious affiliations, which is another major foundation of social network. The results show that a Muslim farmer (who is likely to be a member of a minority religious group in the study area) is 145% less likely to adopt LLL compared to a Hindu farmer.

Another interesting result is the role of government extension in adoption. If the farmer gets the information from government extension his probability of adoption increases by 19% (Exp[-.206]=0.81), suggesting the higher trust farmers put in information from public sources compared to private sources. Furthermore, the coefficient for “time from release to awareness” is negative suggesting if the farmer gets to know about the technology a year later, it is 9% (Exp[-.0888]=0.91) more likely to reduce his time to adopt. This is expected, because if the farmer hears about the technology later, he is likely to get more credible and detailed information about the technology as more people around him would have adopted it and their experiences will bring him more rich information.

2.6.3 Robustness Check

In this section I estimate the relationship between risk parameters and adoption decision using different specification. In column 1 of table 6 I allow standard errors to be correlated at the village level and find that risk aversion and non-linear probability weighting to still be significant. One might be concerned that I did not consider that some of the farmer might have not understood the game even after two rounds of practice games. In our sample 5.6% of the farmers always chose either option A or option B for all of their choices in the game. They might have chosen so because of their inherent risk preference or because they did not understand the game properly. Assuming they did not understand the game, we exclude them from the regression and still find very similar results as indicated in column 4 of table 6. Similarly, it is possible that some of the farmers did not remember the exact year they heard about LLL or misreported it, leading to measurement error. In column 2 of table 6 we define the first time a farmer gets to know about a technology as the year when it was first used by someone in the village and we get very similar results to our original specification. We found 7 farmers who had dis-adopted LLL after using it at least once. At the time of the data collection they identified themselves as dis-adopters. The results do not change by excluding these 7 farmers who dis-adopted LLL as shown in column 3. Credit constraints for adoption decisions are less likely to play a role in wealthier farm households, and as a result, the estimate bias should be minimal among those households. We restrict the sample to the top one-third wealthier households as shown in column 5, and we find that risk aversion is still significant while probability weighting does not, suggesting that credit constraint is less likely to play a role in adoption decision. The results from different specifications suggests that σ, λ, and α are not particularly sensitive to specification suggesting a robust relationship between risk preference parameters and technology adoption.

2. 6.4 Further Discussion

Concerns on causal identification are typical of any cross-sectional study. In this study we have a cross sectional data and we have risk parameters ex post of the adoption decision (Besley and Case, 1993). This could be a cause of concern if risk preferences have changed because of farmers' adoption of laser land leveller. The extent to which adoption decisions changes risk preferences is beyond the scope of this study and we assume temporal stability of risk preferences. Further, lack of any wealth measure prior to adoption may seem problematic, since it is often considered a proxy for credit constraint. Lack of credit is associated with bias of the parameters of risk preferences. However, as almost all of the farmers (99%) in our sample hired this technology and did not buy it makes the credit constraint less of a concern. Cost of hiring this technology is equivalent to a couple days of manual labor wages and is quite affordable by most farmers in our sample.

Another limitation of the study stems from duration model's underlying assumption that all the farmers will eventually adopt this technology. Experts and farmer leaders, we have consulted compare this technology with the tractor and rotavator that most farmers in these two districts have now adopted. Given the pace of adoption and farmers' response in last few years, it is predicted that LLL technology will be also eventually adopted by most farmers. Further, our data is cross-sectional that raises the concern that any ex-post measurement of explanatory variables could be affected by the adoption decision, and they are therefore endogenous (Besley and Case, 1993). Our explanatory variables, however, are unlikely to be endogenous as most of them are time invariant. We have data on land sold and bought by farmers in recent past and it does not show much sale or purchase suggesting that land size at the time of the survey is a good proxy for land at the time a farmer became aware about the technology.

Another possible limitation of this study could be the absence of uncertainty aversion. Instead of risk aversion, uncertainty aversion might play a role in the decision-making process. A commonly used definition that distinguishes risk versus Knightian uncertainty is that “risk is imperfect knowledge where the probabilities of the possible outcomes are known, and Knightian uncertainty exists when these probabilities are unknown” (Hardaker et al., 2004). At the time of deciding on the technology, farmers might not have perfect information on the distribution of Wheat/Rice yields, thus ambiguity aversion becomes an important factor in decision making. Even if one believes that uncertainty aversion ought to play a more prominent role, we find that the results are significant across various specifications, and this could suggest that the risk-aversion measures from the experiment may be a good proxy for uncertainty aversion.

2. 7. Conclusion

Researchers and governments have long promoted the LLL technology as risk reducing. The findings of this study confirm this characterization of the technology by showing that once becoming aware, farmers who are more risk averse and overvalue smaller probabilities have a higher probability of adopting the Laser Land Leveler at any given time. In other words, farmers who are more risk averse and who overvalue smaller probabilities adopt this technology sooner compared to farmers who are risk neutral/loving and farmers who do not over value smaller probabilities.

Since on average farmers are risk averse, the findings of this study have two important implications. First, for a risk reducing technology such as LLL, farmer's aversion to risk is not a limiting variable but an inducing factor in promoting the adoption of this technology. This is contrary to the relationship of risk perception and adoption of other types of agricultural technologies (Liu 2013). Second, the delay in adoption observed in these two progressive districts, is partly explained by the slow rate and speed of diffusion and awareness of this technology. Efforts to promote the diffusion of this and other risk reducing technology using public and private extension channels and diverse modes of information delivery should receive greater attention to help speed up the adoption of such risk reducing climate smart technologies.

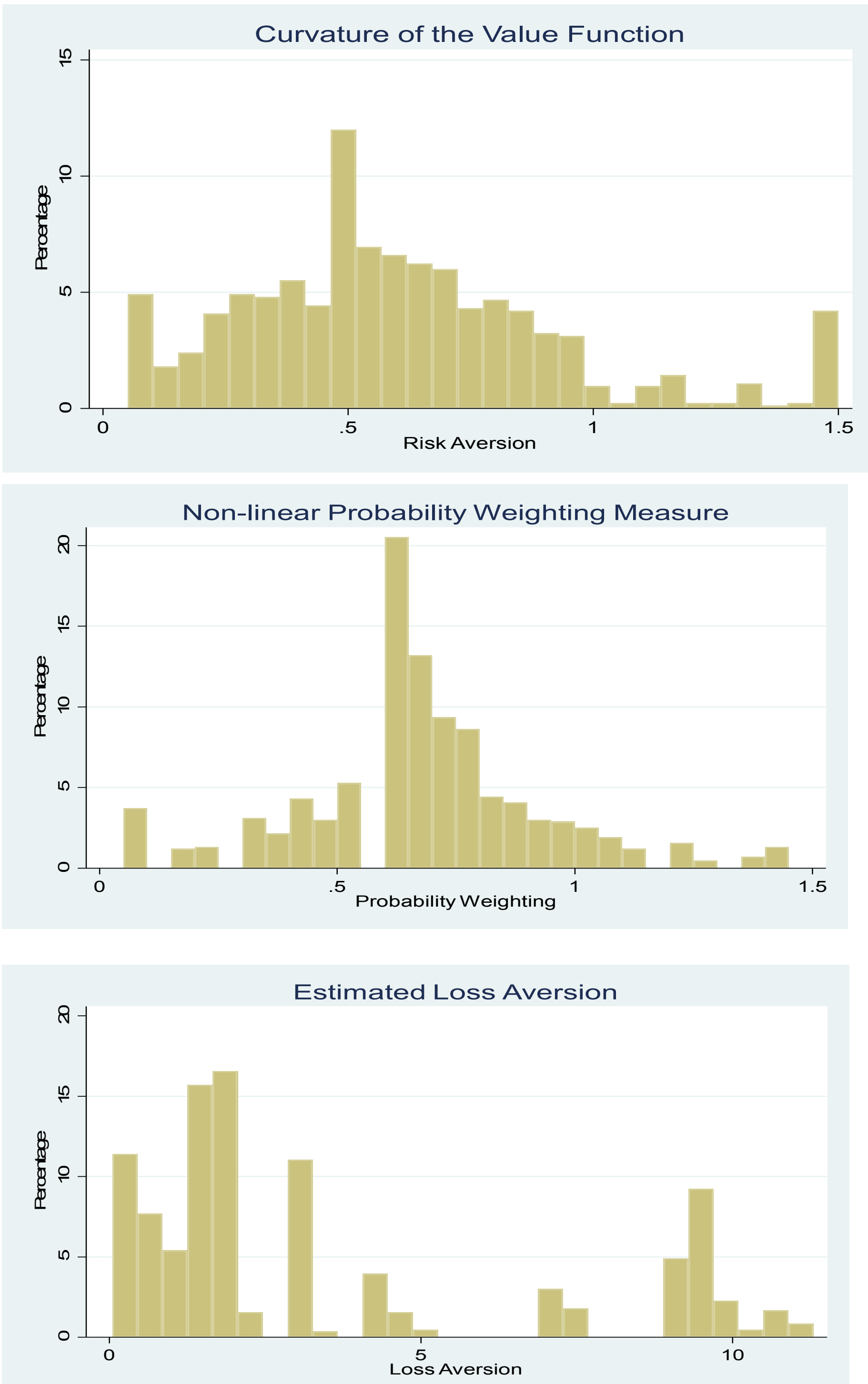
APPENDICES

APPENDIX A: FIGURES

Figure 2. 1: FIRST ROW OF THE RISK GAME

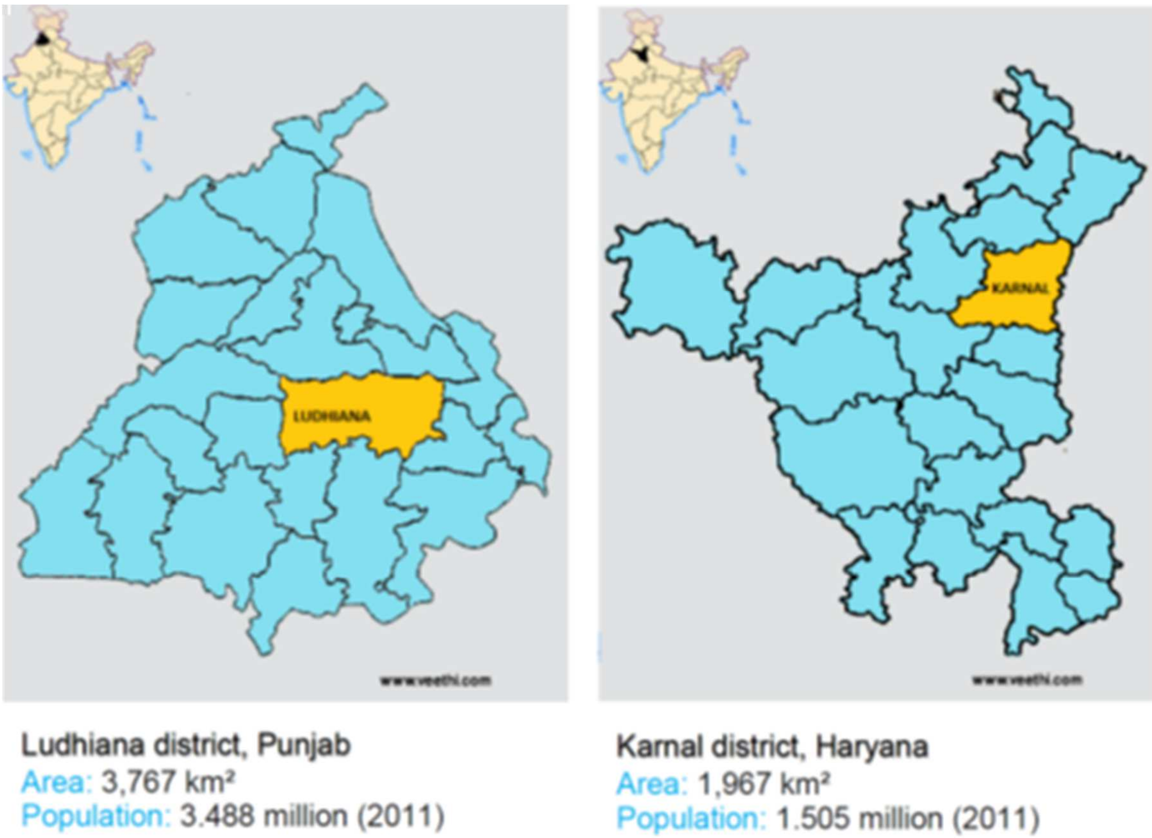
Series 1	Option A			Option B		
Q. no	**Rupees if you get 1,2,3**	**Rupees if you get 4,5,6,7,8,9 10**		**Rupees if you get 1**	**Rupees if you get 2,3,4,5,6,7,8,9 10**	**Q No.**
1	40	10		68	5	1

Figure 2. 2: DISTRIBUTION OF RISK PREFERENCE PARAMETERS



Source: Authors calculations.

Figure 2. 3: LOCATION OF TWO STUDY DISTRICTS



Source: Maps of India

APPENDIX B: TABLES

Table 2.1: SUMMARY CHARACTERISTICS

Variables	Value
Risk Aversion	0.64
	(0.30)
Loss Aversion	3.13
	(2.92)
Non-Linear Probability Weighting Measure	0.70
	(0.22)
Age	42.24
	(12.9)
Education (Years)	9.43
	(3.46)
Household Poverty Score	67.37
	(11.25)
Land Owned in Acres	9.32
	(10.49)
Number of plots	1.16
	(0.37)
Distance to the nearest Agriculture Extension Centre (KM)	10.88
	(9.22)
Number of Mobile Phones in the household	2.48
	(0.92)
Number of Siblings of the head of the household	3.2
	(2.25)
Total Working Member	2.44
	(1.68)
Proportion using mobile for info. on Agriculture	0.28
	(0.45)
Proportion getting advice from Farmer's groups	0.55
	(0.5)
Self-reported value of total Asset (in 1000 Indian Rupees)	558.2
	(422)
Average distance to Plot(KM)	1.54
	(2.62)
Self-rated risk attitude (1= Most adventurous, 4= least Adventurous)	2.22
	(0.88)
Avg Household Size	5.95
	(2.18)
Avg time from release of LLL to farmers knowing about it(years)	9.93
	(1.44)
Avg time for farmers to adopt LLL once they know about it (years)	3.32
	(1.68)
Average time from release of LLL to adoption (years)	13.27
	(1.87)
Observations	432

Note: Standard Deviations are in parenthesis

Table 2.2: PROSPECT THEORY VS EXPECTED UTILITY THEORY

Prospect Theory Holds True

Variable	Description	Mean	Std. Dev.
α	Probability weighting function parameter	0.704***	0.222
σ	Curvature of the prospect value function (risk aversion)	0.643***	0.307
λ	Measure of loss aversion	3.127***	2.918
(Null for σ =1, λ =1, α=1)			

Source: Authors calculations

Table 2.3 : PAYOFF MATRIX FOR THE EXPERIMENTAL GAME

Series 1	Lottery A	Lottery B
1	30% chance of winning Rs.40 and 70% chance of winning Rs.10	10% chance of winning Rs.68 and 90% chance of winning Rs.5
2	30% chance of winning Rs.40 and 70% chance of winning Rs.11	10% chance of winning Rs.75 and 90% chance of winning Rs.5
3	30% chance of winning Rs.40 and 70% chance of winning Rs.12	10% chance of winning Rs.83 and 90% chance of winning Rs.5
4	30% chance of winning Rs.40 and 70% chance of winning Rs.13	10% chance of winning Rs.93 and 90% chance of winning Rs.5
5	30% chance of winning Rs.40 and 70% chance of winning Rs.14	10% chance of winning Rs.106 and 90% chance of winning Rs.5
6	30% chance of winning Rs.40 and 70% chance of winning Rs.15	10% chance of winning Rs.125 and 90% chance of winning Rs.5
7	30% chance of winning Rs.40 and 70% chance of winning Rs.16	10% chance of winning Rs.150 and 90% chance of winning Rs.5
8	30% chance of winning Rs.40 and 70% chance of winning Rs.17	10% chance of winning Rs.185 and 90% chance of winning Rs.5
9	30% chance of winning Rs.40 and 70% chance of winning Rs.18	10% chance of winning Rs.220 and 90% chance of winning Rs.5
10	30% chance of winning Rs.40 and 70% chance of winning Rs.19	10% chance of winning Rs.300 and 90% chance of winning Rs.5
11	30% chance of winning Rs.40 and 70% chance of winning Rs.20	10% chance of winning Rs.400 and 90% chance of winning Rs.5
12	30% chance of winning Rs.40 and 70% chance of winning Rs.21	10% chance of winning Rs.600 and 90% chance of winning Rs.5
13	30% chance of winning Rs.40 and 70% chance of winning Rs.22	10% chance of winning Rs.1000 and 90% chance of winning Rs.5
14	30% chance of winning Rs.40 and 70% chance of winning Rs.23	10% chance of winning Rs.1700 and 90% chance of winning Rs.5
Series 2	Lottery A	Lottery B
1	90% chance of winning Rs.40 and 10% chance of winning Rs.30	70% chance of winning Rs.54 and 30% chance of winning Rs.5
2	90% chance of winning Rs.40 and 10% chance of winning Rs.30	70% chance of winning Rs.56 and 30% chance of winning Rs.5
3	90% chance of winning Rs.40 and 10% chance of winning Rs.30	70% chance of winning Rs.58 and 30% chance of winning Rs.5
4	90% chance of winning Rs.40 and 10% chance of winning Rs.30	70% chance of winning Rs.60 and 30% chance of winning Rs.5
5	90% chance of winning Rs.40 and 10% chance of winning Rs.30	70% chance of winning Rs.62 and 30% chance of winning Rs.5
6	90% chance of winning Rs.40 and 10% chance of winning Rs.30	70% chance of winning Rs.65 and 30% chance of winning Rs.5
7	90% chance of winning Rs.40 and 10% chance of winning Rs.30	70% chance of winning Rs.68 and 30% chance of winning Rs.5
8	90% chance of winning Rs.40 and 10% chance of winning Rs.30	70% chance of winning Rs.72 and 30% chance of winning Rs.5
9	90% chance of winning Rs.40 and 10% chance of winning Rs.30	70% chance of winning Rs.77 and 30% chance of winning Rs.5
10	90% chance of winning Rs.40 and 10% chance of winning Rs.30	70% chance of winning Rs.83 and 30% chance of winning Rs.5
11	90% chance of winning Rs.40 and 10% chance of winning Rs.30	70% chance of winning Rs.90 and 30% chance of winning Rs.5
12	90% chance of winning Rs.40 and 10% chance of winning Rs.30	70% chance of winning Rs.100 and 30% chance of winning Rs.5

Table 2.3 (cont'd)

13	90% chance of winning Rs.40 and 10% chance of winning Rs.30	70% chance of winning Rs.110 and 30% chance of winning Rs.5
14	90% chance of winning Rs.40 and 10% chance of winning Rs.31	70% chance of winning Rs.130 and 30% chance of winning Rs.6
Series 3	Lottery A	Lottery B
1	50% chance of winning Rs.25 and 50% chance of losing Rs.4	50% chance of winning Rs.30 and 50% chance of losing Rs.21
2	50% chance of winning Rs.4 and 50% chance of losing Rs.4	50% chance of winning Rs.30 and 50% chance of losing Rs.21
3	50% chance of winning Rs.1 and 50% chance of losing Rs.4	50% chance of winning Rs.30 and 50% chance of losing Rs.21
4	50% chance of winning Rs.1 and 50% chance of losing Rs.4	50% chance of winning Rs.30 and 50% chance of losing Rs.16
5	50% chance of winning Rs.1 and 50% chance of losing Rs.8	50% chance of winning Rs.30 and 50% chance of losing Rs.16
6	50% chance of winning Rs.1 and 50% chance of losing Rs.8	50% chance of winning Rs.30 and 50% chance of losing Rs.14
7	50% chance of winning Rs.1 and 50% chance of losing Rs.8	50% chance of winning Rs.30 and 50% chance of losing Rs.11

Table 2.4: PROBIT MODEL FOR ADOPTION

VARIABLES		Coefficient
Risk Aversion Coefficient		-0.399*
		(0.216)
Probability Weighting		-1.103***
		(0.280)
Loss Aversion		0.006
		(0.023)
Age		0.012
		(0.010)
Education(Years)		0.042
		(0.031)
Percentage of Income from Wheat-Rice		0.016***
		(0.005)
Household Poverty Score		-0.003
		(0.009)
Land Owned Acres		0.003
		(0.018)
Number of Wheat-Rice Plots		0.576**
		(0.275)
Distance to Nearest Agricultural Ext. Centre		0.024
		(0.015)
Number of siblings		-0.109**
		(0.054)
Percentage Area Sandy-Loamy		0.149
		(0.264)
Total Working member		0.005
		(0.028)
Whether use mobile for info on Agri.		0.330
		(0.201)
Whether gets info from farmer's group		0.271
		(0.235)
Religion	1. Muslim	0.390
(Base Hindu)		(0.350)
	2. Sikh	-0.090
		(0.279)
	3. Others	0.648
		(0.482)
Source of Info- Government Extension		0.667***
(Base- Private)		(0.242)
Average Distance to Plot (KM)		0.000
		(0.033)
Interaction with no. of Farmers	1. (75-100)	-4.739***
Base (100+)		(0.480)

Table 2.4 (cont'd)

	2. (50-75)	-4.204***
		(0.491)
	3. (30-50)	-5.196***
		(0.535)
	4. (20-30)	-5.483***
		(0.623)
	5. (10-20)	-6.137***
		(0.664)
	6. (0-10)	-11.975***
		(0.654)
Time from release to Awareness (years)		-0.191**
		(0.097)
Whether adopts early(self-reported)		0.235
		(0.192)
State - Haryana		-0.525
(Base Punjab)		(0.570)
Constant		-387.736**
		(195.219)
Observations		432

Standard errors clustered at Village level> Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 2.5: WEIBULL MODEL FOR DURATION OF TIME TO ADOPTION

VARIABLES		(1)	(2)	(3)
Risk Aversion Coefficient			0.188*	0.045*
			(0.111)	(0.025)
Probability Weighting			0.185*	0.042*
			(0.107)	(0.023)
Loss Aversion			-0.005	-0.002
			(0.009)	(0.003)
Age		-0.00159	-0.00132	-0.000127
		(0.00305)	(0.00456)	(0.000731)
Education(Years)		-0.0132	-0.0132	-0.00255
		(0.0109)	(0.0138)	(0.00249)
Percentage of Income from Wheat-Rice		-0.00403*	-0.00441*	-0.00104**
		(0.00216)	(0.00226)	(0.000509)
Household Poverty Score		-0.00371	-0.00402	-0.000909
		(0.00314)	(0.00361)	(0.000719)
Land Owned Acres		-0.00175	-0.00166	-0.000343
		(0.00239)	(0.00361)	(0.000619)
Number of Wheat-Rice Plots		-0.151**	-0.150*	-0.0349**
		(0.0679)	(0.0823)	(0.0147)
Distance to Nearest Agricultural Ext. Centre		-0.0110	-0.00847	-0.00267
		(0.00895)	(0.00659)	(0.00217)
Number of siblings		-0.0127	-0.0159	-0.00454
		(0.0188)	(0.0179)	(0.00433)
Percentage Area Sandy-Loamy		0.0991	0.101	0.0296
		(0.1000)	(0.106)	(0.0239)
Total Working member		-0.00423	-0.00647	-0.000118
		(0.0154)	(0.0164)	(0.00357)
Whether use mobile for info on Agri.		-0.105	-0.122	-0.0267
		(0.0764)	(0.0922)	(0.0184)
Whether gets info from farmer's group		-0.0585	-0.0209	0.00178
		(0.116)	(0.128)	(0.0271)
Religion	1. Muslim	0.821**	0.896***	0.125*
(Base Hindu)		(0.339)	(0.333)	(0.0754)
	2. Sikh	-0.0951	-0.140	-0.0336
		(0.187)	(0.160)	(0.0422)
	3. Others	-0.233	-0.310	-0.0765
		(0.364)	(0.194)	(0.0819)
Source of Info- Government Extension		-0.236**	-0.206*	-0.0590**
(Base- Private)		(0.117)	(0.118)	(0.0269)
Average Distance to Plot (KM)		-0.0230**	-0.0262**	-0.00526***
		(0.00963)	(0.0113)	(0.00156)
Interaction with no. of Farmers	1. (75-100)	0.155	0.185	0.0455
Base (100+)		(0.245)	(0.237)	(0.0418)
	2. (50-75)	-0.0631	-0.0188	-0.0135
		(0.291)	(0.269)	(0.0565)
	3. (30-50)	0.305	0.363	0.0749
		(0.291)	(0.291)	(0.0577)

Table 2.5 (cont'd)

4. (20-30)	0.359	0.453*	0.0966
	(0.290)	(0.273)	(0.0589)
5. (10-20)	0.544*	0.621**	0.141**
	(0.308)	(0.313)	(0.0642)
6. (0-10)	5.800***	5.845***	1.345***
	(0.493)	(0.721)	(0.110)
Time from release to Awareness (years)	-0.0888**	-0.0854*	0.0609***
	(0.0380)	(0.0495)	(0.00958)
Whether adopts early(self-reported)	-0.0969	-0.0453	-0.0136
	(0.121)	(0.155)	(0.0293)
State - Haryana	-1.336***	-1.376***	-0.281***
(Base Punjab)	(0.387)	(0.307)	(0.0895)
Constant	3.649***	3.323***	2.305***
	(0.742)	(0.871)	(0.169)
Observations	432	432	432

Note: All regressions include Village fixed effects. Standard errors clustered at Village level
*** p<0.01, ** p<0.05, * p<0.1

Table 2.6: WEIBULL MODEL FOR DURATION OF TIME TO ADOPTION: ROBUSTNESS CHECK

VARIABLES	(1) Cluster	(2) Village	(3) Excluding-Disadopters	(4) No Switch	(5) Top one third
Risk Aversion	0.249***	0.288***	0.204**	0.217*	0.460*
	(0.0846)	(0.105)	(0.0404)	(0.110)	(0.241)
Probability Weighting	0.218**	0.233*	0.240**	0.259***	-0.131
	(0.107)	(0.125)	(0.0140)	(0.0985)	(0.234)
Loss Aversion	-0.00825	0.00127	-0.0107	-0.0117	-0.00535
	(0.0101)	(0.0115)	(0.251)	(0.00953)	(0.0214)
Age	-0.000728	-0.000870	0.000352	-0.000859	-0.00335
	(0.00461)	(0.00356)	(0.908)	(0.00299)	(0.0035)
Education	-0.00653	-0.00126	-0.00542	-0.00769	0.00127
	(0.0138)	(0.0119)	(0.633)	(0.0113)	(0.0175)
HH Poverty Score	-0.00450	-0.00541	-0.00499	-0.00520*	-0.000704
	(0.00356)	(0.00371)	(0.101)	(0.00303)	(0.0122)
Income from wheat and Rice	-0.00410*	-0.00480*	-0.00412**	-0.00483**	-0.00210
	(0.00240)	(0.00247)	(0.0466)	(0.00208)	(0.0023)
Land Owned Acres	-0.00425	-0.00890**	-0.00453**	-0.00360*	-0.00114
	(0.00320)	(0.00349)	(0.0309)	(0.00202)	(0.0036)
Distance to Ag Ext(KM)	-0.000746	-0.0128	-0.000240	0.000934	-0.0163
	(0.00754)	(0.0103)	(0.979)	(0.00990)	(0.0115)
Dummy Info from extension	-0.306***	-0.441***	-0.319***	-0.292**	0.0910
	(0.105)	(0.137)	(0.00472)	(0.122)	(0.169)
Year First Known	-0.0790	-0.226***	-0.0842**	-0.0718*	-0.122
	(0.0492)	(0.0841)	(0.0280)	(0.0377)	(0.0779)
Dummy for Haryana State	-1.013**	0.545	-0.925**	-0.754*	0.523
	(0.397)	(0.631)	(0.0412)	(0.424)	(0.765)
Constant	160.8	455.5***	171.1**	145.9*	245.9
	(99.06)	(169.5)	(0.0266)	(75.94)	(156.1)
Observations	432	432	425	408	158

Robust standard errors in parentheses. All other variables used in the main regression used, but not reported in this table. *** p<0.01, ** p<0.05, * p<0.1

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CHAPTER 3: EFFECTS OF IN-UTERO RAINFALL SHOCKS ON CHILDREN'S HEALTH IN MALAWI

3.1. Introduction

In utero gestation period is a very crucial and sensitive time in the life of an individual. There is a growing literature documenting how social, emotional and environmental events during the gestational period can have long term consequences throughout the adult life (Barker 1998, Bhalotra & Venkatramani 2015, Beach et al 2016). These effects can be biological, and/ or socioeconomic in nature. Due to weak institutions, populations within developing countries face shocks related to disease outbreak, food and water scarcity and weather anomalies more frequently compared to developed industrialized countries. Also, due to limited resources, children born in poor families who are exposed to adverse gestational shocks are less likely to recover in their later life (Almond & Currie 2011).

The gestational effects mentioned above are channeled through the mother. The emotional, mental and physical health of the mother thus plays a crucial role in determining the biological and socioeconomic growth trajectory of the child. For example, a child born to a malnourished mother can limit his/her abilities to cope with health issues later in life (Currie and Vogl, 2013). It is important to study the effects of such shocks during gestational period on the long -term health consequences among children in the context of developing countries, especially because if there is a possibility of mitigation of the adverse effect of such shocks, then policy interventions could be designed to minimize the health implications of gestational shocks.

Many developing countries are increasingly facing health challenges due to environmental anomalies and shocks, exacerbated by climate change. Rainfall variability is one such factor that has been found to have an impact on general health and well-being (WHO 2008). Agriculture in most developing countries is dependent on rain. Thus, rainfall has a major influence on food and water availability. Poor rainfall can directly affect the harvest and have negative health outcomes for populations directly dependent on agriculture. In addition, climate change as an increasing concern is further exacerbating rainfall variability and hydrological cycles in many regions of the world (Nan, Bao-hui and Chun-kun, 2011).

This paper studies the impact of the rainfall shocks during the gestational period on the health outcomes of children aged 0-5 years in Malawi. We use nationally representative datasets from the World Bank's Living Standard Measurement Survey (LSMS) for information on socio economic profile of the households and child anthropometrics. We further use the daily rainfall data for 1981-2017 for each of these households by connecting them to the high-resolution climate data from Climate Hazards Group Infrared Precipitation with Stations (CHIRPS) using the corresponding GPS coordinates of the households. We calculate the total rainfall and rainfall anomaly compared to the 37-year average, during the 12 months prior to the birth. The 12 months includes 9 months of gestational period and 3 months prior to that which is considered very important for health outcomes of the child in the literature (Kudamatsu et al., 2010).

Our identification strategy relies on the hypothesis that temporary rainfall deviations from historical averages, are uncorrelated with other latent determinants of health during gestation. Under this assumption, we are able to identify the causal impact of rainfall variation during the in-utero period on outcomes after birth. Our results indicate that negative rainfall shocks during the gestational period leads to lower height for age for 0-59 month old children, which is a standard measure of chronic stunting. We also find a significant negative effect of flood (excessive rain) defined as one standard deviation above the average rainfall, on the height for age measure. The results remain significant in the rural areas but not in the urban areas, suggesting an agricultural production pathway for the shock.

Malawi is one of the poorest countries and ranks 170 out of 187 in human development index (Human development Report 2016). It has gone through some major droughts and some parts of the country have experienced floods in the past dozen years (Ellis & Manda 2012). With significant population dependent on agriculture, these weather shocks are likely to have caused major negative impacts on the population especially children. This paper is an attempt to quantify the effect of such weather shocks during gestational period on the health of the child for providing policy suggestions to mitigate the shocks by positive reinforcements.

The paper is organized as follows. Section 2 covers the literature review. Section 3 discusses the data source. Section 4 discusses the possible pathways for the gestational shock to impact the future health of the child. Section 5 describes the general econometric frameworks used to test the predictions and describes the empirical results. Section 6 covers robustness check. Section 7 concludes the paper.

3.2. Literature Review

Until the 1960s placenta was regarded as a "perfect filter, protecting the fetus from harmful substances in the mother's body and letting through helpful ones". (Landro 2010). During the baby boom period in the US, women were told that it was fine to smoke and drink during pregnancy. Around half of pregnant mothers in the US reported smoking in 1960; something that seems incomprehensible nowadays (Aizer, Stroud, and Buka, 2009). David J Barker, challenged this idea by introducing the fetal origin hypothesis (FOH), which underscored the importance of in utero period in shaping the future abilities and health trajectories of a baby. The hypothesis argued that the intrauterine environment - and nutrition in particular- "programs" the fetus to have particular metabolic characteristics, which can lead to future disease (Barker, 1990). Barker argued that individuals starved in utero are more likely to suffer from diseases associated with obesity, including cardiovascular problems and diabetes.

The fetal origin hypothesis uncovers many key ideas that are crucial for understanding the impact of in utero and early childhood period in one's life. First, effects of fetal conditions are persistent. Second, the effect of the shock during the in utero period can stay latent till many years and start kicking in only when the child grows up as an adult. Typically, diabetes and heart disease does not emerge as a problem until middle age. Third, the hypothesized effects reflect a biological mechanism, akin to fetal programming, possibly through effects of environment on the epigenome, which are just beginning to be understood. Epigenome can be considered analogous to a switching mechanism that defines which parts of the genome are going to be expressed, and which parts are not. The period in utero may be particularly important for setting these switches (Petronis, 2010).

The large magnitude of impact of in utero period on the life of a person suggests that Pareto improvements can be made by reallocating resources from later in life to earlier, at a household level, society level or as a policy principle (Almond & Currie 2010). This idea struck a chord with economists and their interest in this theory has been ever increasing since early 1990s Even though, fetal origin hypothesis initially explained the link of mother's nutritional shock to chronic adult health conditions, new evidence by economists suggests that other non-health outcomes like IQ and wages can be linked to prenatal and early life shocks. Further, FOH literature suggest that it may be possible to counter the effect of negative prenatal shocks by improving investments in pregnant women and young children. Such investments can be made by government and non-government sectors in the form of education programs, nutrition interventions, and clinical support to such women. Three interventions that have been shown to be effective are nurse home visiting programs, nutritional supplementation for pregnant women, and quality early childhood education programs (Currie 2011).

There has been a growing literature in economics around the correlation between shocks and events experienced by mothers during gestational periods and its later life outcomes for children and adults (Almond, 2006). Within these studies, researchers have studied the link between in utero or early infant exposure to nutritional shock, diseases, stress, pollutions and environmental shocks and later life outcomes such as adult health, forms of disability, mortality rate, cognitive ability, or socio-economic status (Almond, Currie, and Duque, 2017).

In utero nutritional shocks are probably the most studied type of shock with effects found on a range of health and non-health outcomes ranging from birth weight to learning abilities. Almond and Mazumder (2011) studied the effect of in utero nutritional shock by estimating the effect of pregnant mother’s exposure to Ramadan fasting on birth outcomes and adult disability and mortality in Michigan, Iraq and Uganda. They found that, this in utero nutritional shock of pregnant mother’s fasting led to higher rate of adult disability, higher mortality as adult and lower wealth accumulation. Further, Almond, Mazumder and Van Ewikj (2015) found that the effect of the same shock led to lower school attainment and lower test scores for children under seven in England. Adhvaryu et al. (2016) found that the of introduction of iodine salt in the food of pregnant mother, led to higher labor force participation and positive wage earnings among adults 25-55 years old decades later in the US. Fitzsimons and Vera-Hernandez (2013) found a significant positive effect of breastfeeding on cognitive development among kids in the UK. Likewise, positive nutrition-related shocks can also have substantial effects even when relatively mild. For example, Linnemayr and Alderman (2011) examine nutritional supplementation for pregnant women and 0 to 3 year-old children in Senegal and find that supplementation during pregnancy has a significant effect on the weight-for-age of toddlers, but that post-birth supplementation had little impact, suggesting the uniqueness of the in utero period.

Aizer, Stroud and Buka (2016) examined the effect of stress on pregnant mothers characterized by cortisol level on the educational outcomes of the children. They found that higher cortisol level during the in utero period, leads to lower educational attainment among children at 7 years of age in the US. Exposure to pollution during pregnancy can be another major determinant of the child health and learning outcomes. Bharadwaj et al. (2014) found that fetal exposure to carbon monoxide leads to a lower math and language test scores among fourth graders in the UK.

Some diseases that have only mild effects in adults are known to have devastating effects on a developing fetus (e.g., Rubella, Zika), while others, like pandemic influenza killed millions and have also been shown to have effects on fetuses in utero. Almond (2005) uses the 1918 influenza pandemic as a natural experiment for testing the fetal origins hypothesis. The study shows that cohorts in utero during the pandemic displayed reduced educational attainment, increased rates of physical disability, lower income, lower socioeconomic status, and higher transfer payments compared with other birth cohorts. Schwandt (2017) found that pregnant mothers who suffer from seasonal influenza have children with lower birth weight in Denmark. Further, these children when they grow up as adults, end up earning less and depend more on public welfare compared to children of mothers who did not experience this shock. Similarly, diseases like malaria and seasonal influenza can have negative long-term effects if a fetus is exposed to these during pregnancy (Venkataramani 2012; Currie and Schwandt 2013).

Various studies have examined the effect of weather shocks during gestational period, early childhood, and on the adult health. Factors such as temperature and rainfall have been found to have an effect on pregnant women, fetus in utero, and other lifelong outcomes. Some studies focus on the time during the effect of a weather shock during infancy on lifelong outcomes. In their study, Maccini and Yang (2009) examined the effect of rainfall variation around the time of birth on the health, education, and socioeconomic outcomes of Indonesian adults born between 1953 and 1974. The results showed that higher rainfall in early years of life had positive effects on the adult outcomes, especially for women. Higher temperatures during early childhood are associated with lower adult height (Agüero, 2014). Aguilar and Vicarelli (2011) report that the climatic event of *El Niño Southern Oscillation (ENSO)*, showed effects on the early childhood development of children even after four to five years from when they were first exposed to the shock. Their analysis showed that children exposed to ENSO during their early stages of life had test scores in language development, working-memory, and visual-spatial thinking abilities that were 11 to 21 percent lower than same aged children not exposed to the shock. Another study showed that Zimbabwean children exposed to drought in early life (12-24 months of age) showed a decrease in annual growth among these children by 1.5 to 2 cm. Even after four years from the drought year, these children remained shorter in heights compared to other children their age who had not experienced the drought. (Hoddinott and Kinsey 2006).

Furthermore, Rocha and Soares (2015) showed evidence that water scarcity during gestational period influenced health of a baby at birth. They found that negative rainfall during in utero gestation period was strongly associated with higher infant mortality, low birth weight, and pre-matured births (i.e., shorter gestational periods). Another study by Linnemayr and Alderman (2011) suggests that exposure to moderate low-temperature shocks (i.e., cold waves) during the first and second trimesters of pregnancy are associated with lower length at birth. Extreme weather shocks during pregnancy also have particularly negative effects on the developing fetus. Shocks generated by two powerful tropical storms striking Puerto Rico during the late 1920s and early 1930s had long-term consequences on the health of individuals who were exposed to the storms as infants. Individuals who were exposed to storms as infants were found more likely to report a diagnosis of hypertension, high cholesterol, and diabetes (Orlando Sotomayor 2013). Moreover, exposure to a hurricane during pregnancy has been associated with increased probability of abnormal conditions of the newborn (Robert S. Scholtea, Gerard J. van den Bergb, Maarten Lindeboomd, 2015). We situate our study under this category of studies where we find the impact of in-utero weather shock on the health outcomes of 0-5 years of children in Malawi.

3.3. Conceptual Framework

3.3.1 Health Production Function

Following Heckman (2007), we present our simplistic model of health production as a two period Constant Elasticity of Substitution (CES) function depicted in equation 1.

$$h = A\ [\alpha\ (\bar{I}_1 + \mu_1))^{\sigma} + (1 - \alpha)(I_2 + \mu_2)^{\sigma}]^{1/\sigma} \quad (1)$$

Where h represents health or human capital. In our case h would denote the health of children under 5. A denotes the productivity, $\bar{I}_1$ and I_2 are the parental investments made in gestational period and after birth respectively. Let us suppose $\bar{I}_1$ is fixed and what is under consideration is the second period investment. α is the weight parameter that each period in childhood gets in the production of adult health.

Following Currie and Almond (2011), we assume that μ_1 is an exogenous shock in first period (gestational period in our case) and μ_2 is an exogenous shock in second period (0-5 years in our model). The parameter σ, denotes the extent to which investments in different periods are substitutes or complements, often a key question determining the efficacy of interventions.

We assume that parents make the investment decisions for their child. Investments are costly, and are valued insofar as they improve *h*. Parents maximize their utility, U = U(C, h), which is increasing in both their own consumption (C) and their child's health (h), given their budget constraint.

$$Y = p_c C + p_I I_1 + p_I I_2/(1+r) \tag{2}$$

If the first period shock μ_1 is negative, then the effect of this shock can be "faded away" either by increasing the second period investment I_2 or by giving an exogenous positive shock μ_2 in period 2. If the parents do not have a wealth constraint in period two, they are likely to provide higher investment I_2 in period 2 to mitigate the effects of negative weather shock on their child's health over time. However, if the parents face budget constraint, the effect of pre-natal weather shock will persist till later in life. In such cases, a public investment creating positive μ_2 shocks are likely to help counter the effect of gestational shock. We will test this hypothesis in our results to see if the children belonging to wealthier households recover from this shock over time and does the shock persists among the children from poorer households.

3.3.2 Pathways Through Which Rainfall Can Impact Child's Health

Low rainfall is a major problem in many parts of Malawi. In this context we discuss two channels of how low rainfall might affect the fetus in the gestational period. First, lack of rainfall may directly impact households dependent on agriculture through reduced nutrient intake due to lower food production and availability of less variety of food (i.e., low dietary diversity). This leads to malnutrition and micronutrient deficiency, potentially including deficits of vitamins A, B1, B3, C, and iron (WHO, 2012). Second, lack of inadequate rainfall would lead to water scarcity in the traditional water resources like ponds, wells, rivers etc. Scarcity of water, decreases the use of water for personal hygiene, increase the travel time to collect water (i.e., increases physical stress), increases the need to store water in unsanitary conditions, and decreases the quality of the traditional sources of water (Mara, 2003; Pond et al., 2011; Sobsey, 2002). In combination with poor sanitation, inadequate access to water is the leading risk factor for diarrheal diseases. Diarrhea is caused mainly by pathogens that are ingested from unsafe water, contaminated food, or hands. It is the second most important factor in the global burden of diseases (WHO, 2010) and it increases the susceptibility to and the severity of new infections, reinforcing a vicious cycle (Fewtrell et al., 2007).

Pregnant women and their fetuses are particularly vulnerable to the health problems associated with water scarcity (Pond et al., 2011). Biological demands for water and nutrients are greatly enhanced during pregnancy. Water deprivation may cause low levels of amniotic fluid in the later trimesters, leading to fetal malnutrition and malformation. During gestation, body's need for water increases by 7 to 8 liters, which are roughly shared between the maternal and the fetal placental compartments (Barron, 1987). Increased basal metabolism and tissue synthesis also raise the demand for nutrients. Requirements of proteins, fats, various vitamins (including A, B1, B3, and C), iron, iodine, and zinc are increased. Deficient intake of some of these may lead to birth defects, low birth weight, obstetric complications, premature birth, and higher perinatal mortality (Steegers-Theunissen, 1995). Water deprivation by itself may also lead to dehydration–anorexia, resulting in an additional channel of nutrient stress (Ross and Desai, 2005). In short, health shocks faced by the mother during pregnancy – related to malnutrition and dehydration are reflected on the health of the newborn, which increases its susceptibility to infections and is further enhanced by the long-term implications of fetal growth trajectory.

Excessive rainfall is as bad for the crops as low rainfall. Beyond a certain point, rainfall not only starts hurting normal life, but also agricultural productivity and people's livelihoods. There are various mechanisms through which excessive rainfall creates a shock during the gestational period. It washes away nutrients and, in some cases, entire crop, resulting in lower production. Water is a major carrier of pathogens and floods/excessive rainfall creates conditions conducive for spreading harmful pathogens in a tropical country like Malawi. Overall, excessive rainfall also has a significant impact on the health of pregnant women and children.

3.4. Data.

3.4.1 Socio-Economic and Anthropometric Data

We use the Integrated Household Survey (IHS)/LSMS datasets for information on the socio-economic status and individual level demographic data along with the child level anthropometric information. IHS is one of the primary instruments implemented by the Government of Malawi through the National Statistical Office to monitor and evaluate the changing conditions of Malawian households. The IHS data have, among other insights, provided benchmark poverty and vulnerability, while also cover a wide range of information on agriculture. We use the two most recent rounds (third and fourth rounds) of IHS for Malawi. The third round was conducted in the year 2010 and covered 12,271 households while the fourth round was conducted in the year 2016-17, and covered 12,447 households. Both the third and the fourth round samples provide district-level representativeness and a reasonable level of precision for key socioeconomic and agricultural indicators. This dataset is not a panel dataset, so there is no household in the two rounds that are repeated purposefully.

Using the repeated cross-sectional microdata on height, weight, age, gender, and odema status, we construct the z-scores for children under 5 years of age. We have in total of 13,277 under 5 years old children across both the rounds with 7,159 children in the third round and 6,118 children in the fourth. We focus on height-for-age z-score (HAZ) as an objective measure of child's growth and a proxy of child's health endowment. We restrict all our analyses for children who have HAZ scores between -5 and 5, to account for measurement error that might have been an outcome of incorrectly measuring child's anthropometrics (WHO 2006).

HAZ score uses an international reference, since the growth in height of healthy children under 5 years of age from different ethnic backgrounds and different continents is reasonably similar. These international standards were developed based on the scientific evidence that children born in any region of the world, if given an optimum start in life, have the same potential for growth and develop within the same range of height and weight for age. The WHO child growth standards used worldwide, provides a common basis for the analysis of anthropometrics data (WHO 2006). As HAZ measures each child's height in relation to the distribution of children of the same age and gender across the globe, it provides an objective means of comparison and is used as a measure of malnutrition around the world.

To find the impact of in-utero rainfall shock on child's HAZ score, we use the recently released GPS coordinates for the households to collect the rainfall information from past multiple decades. Then we used this rainfall information and linked them to the corresponding child based on the location of the household. A major assumption is that the mother would have spent most of the time in the 12 months prior to the birth of a child in the same village where child resided at the time of the survey. In the following section we explain the creation of the rainfall variables.

Table 1 presents the descriptive statistics of the sample. There are a total of 13277 children in sample with an average age of 3.09 years. Almost half of the children are female and the average household size is 5.46. More importantly, we find that average height for age Z score value is -1.2 signifying the adverse state of child health in Malawi. Further we find that 29% percent of the under 5 children are stunted according to the WHO definition of WHO (WHO Stunting definition: A child with Height for Age score is less than -2). We find that 16% of the households reside in urban areas, which leaves majority of the sample in rural areas with average distance from a nearest small town to be 35 kilometers. A mere 8% of the households have electricity and 33 percent of sample avails the coupons for agricultural input subsidy; a major program of the government of Malawi.

3.4.2 Rainfall Data

We use rainfall data from the Climate Hazards Group Infrared Precipitation with Stations (CHIRPS) dataset. This data is built on interpolation techniques that uses high resolution estimates based on infrared Cold Cloud Duration (CCD) observations and real station weather data and therefore is considered more accurate than just CCD data or station data. CHIRPS provides daily data at a very granular level at the resolution of 0.05° x 0.05°, which corresponds to approximately a 5km X 5km grid. Higher resolution and precision of this data allows for quantifying the impacts of location-specific changing precipitation patterns on human life (Peterson et al. 2015).

We use the daily rainfall data from 1981 till 2017 for every single GPS coordinates that corresponds to a household to two variables measuring rainfall fluctuation during an individual's gestation period. The first variable is defined by the following equation (Rocha & Saores 2015)

$$RD_{iT} = ln\ \left(\sum_{t=T-11}^{T} r_{it}\right) - \ln \mu_i \quad (3)$$

where r_{it} indicates the cumulative monthly rainfall in the location of the household i in month t. μ_i is the average total annual rainfall in the location of household i over the 37 years (1981-2017). T indicates an individual's month of birth. Thus, RD_{iT} is defined as the deviation between the natural logarithm of the total rainfall in the 12 months prior to the individual's birth and the natural logarithm of the average yearly rainfall in the location of household i. We consider 12 months prior to birth, instead of 9 months, because evidence suggests that the nutritional status of the mother immediately before conception is also important in determining birth outcomes (Kudamatsu et al., 2010). Medical studies, for example, identify a correlation between birthweight and the pre-pregnancy weight of the mother (Bloomfield et al., 2006). The variable RD_{iT} can be approximately interpreted as the percentage deviation from mean rainfall. For instance, a value of 0.05 means that rainfall over the 12 months prior to an individual's birth was roughly 5% above average.

The second shock variable is a binary variable designed to capture excessive rainfall event, referred as ‘flood’ variable in this study. Malawi has a sub-tropical climate, which is relatively dry and strongly seasonal. Almost all of Malawian agriculture depends on rainfall, so given the dry weather it is generally assumed that higher rainfall will lead to better agricultural production. However, there is a limit to how much rainfall is good; beyond a certain point excessive rain can hurt agriculture, sanitation, transport, and the biological ecosystem. Further there are various low-lying areas such as Lower Shire Valley and some localities in Salima and Karonga that are more vulnerable to floods during excessive rainfall than higher grounds.

We define an episode of a flood in the following way. Note that flood here does not literally mean a flood, but very heavy rainfall that is likely to disrupt the usual life and prove to be counter-productive to agriculture and health.

$$F_{iT} = \begin{pmatrix} 1 \quad if \ \sum_{t-11}^{T} r_{it} > \left(\bar{r_i} - r_i^{SD}\right) \\ 0 \ otherwise \end{pmatrix} \tag{4}$$

Where r_i^{SD} is the historical annual standard deviation of rainfall for the location of household i (for the period of 1981–2017). $\bar{r_i}$ is the average historical yearly rainfall in the area that the household i resides in. F_{iT} =1 if the rainfall over the 12 months prior to an individual's birth was more than one standard deviation above the historical average the location of the household i. Figure 2 presents the annual average rainfall for the entire country from 1981-2017 and the average rainfall for the entire period. The figure shows a zigzag pattern with some years' rainfall below 800 mm while in some years the rainfall goes beyond 1200 mm with the average over the entire period as 992 mm per year. However, this figure masks the spatial heterogeneity in rainfall, which varies from less than 500 mm in some places in some years to more than 2000 mm in others.

3.5. Empirical Strategy

The sample for this study is composed of cross sectional data, which is representative at the district level. We use two specifications for our analyses, one with enumeration area fixed effects and another with household fixed effects. In the first specification, we analyze the impact of shocks during gestational period on health outcome at the child level with district fixed effects.

3.5.1 Enumeration Area Fixed Effect:

There are a total of 1539 enumeration areas and they closely approximate the villages and therefore controls for village level unobserved heterogeneity.

$$H_{it} = \beta_0 + \beta_1 RD_{iT} + \beta_2 F_{iT} + \eta_E + \gamma_t + X_{it} + \varepsilon_{it} \quad (5)$$

Where H_{it} is the health outcome of child i in round t (measured by HAZ), RD_{iT} is the rainfall variable defined in equation 3 (i.e. log-deviation of rainfall in the 12 months prior to birth of the child), F_{iT} is the indicator of excessive rainfall in the same period, which we defined as one standard deviation above average. We keep both rainfall deviation and flood in the same equation to capture both the positive and negative effects of rainfall. As the rainfall increases, the effects on H_{it} is likely to be positive until a certain point, where the effect of flood kicks in and therefore keeping the flood dummy will help us capture that effect. η_E is the enumeration area fixed effect and γ_t is the round fixed effect. X_{it} includes other control variables at the child level, like gender, age and household level variables like education level of household head etc. ε_{it} is the idiosyncratic error term.

The main concern in this specification is the possibility of confounding omitted factors correlated both with rainfall and health outcome between the age of 0-5 years. This is clearly the case in the cross-section data, since places with harsher climate are also likely to have worse socioeconomic conditions. Districts are common across both the rounds and data is representative at the district level. Thus we take enumeration area (approximates village) fixed effect to control for any effect associated with climatic or socio-economic conditions typical of an area. Round fixed-effects, in turn, capture aggregate shocks impacting the entire Malawi and secular trends in health outcomes.

Our identification relies on the assumption that a temporary rainfall deviation from historical average or excessive rainfall (i.e., the ‘shock’ variables) – are uncorrelated with any latent determinant of health during the first few years of a child. Under this assumption, we are able to identify the causal impact of rainfall shocks on early life outcomes. It is difficult to think of plausible stories of endogeneity or omitted factors when considering this type of transitory variation in rainfall, conditional on all our independent variables.

A potential problem in our analysis is selection bias due to death of the child during birth or between 0-5 years. Shocks that might have caused the death of the child in fetus, at birth or after birth, and before the data collection are not part of our analysis and thus could lead to some selection bias. This type of caveat is recurrently mentioned in the birth weight literature (Currie, 2009). Further, these shocks could reduce women's fertility due to health or behavioral responses, which would imply that the population of surviving newborns might be different from what it would otherwise have been.

3.5.2 The Household Fixed Effect Model

In order to control for unobserved heterogeneity at the household level, we use the next specification with household fixed effect. Note that we do not have a panel data, so we have to restrict this analysis to only those households who have at least two children below the age of five.

$$H_{iyt} = \beta_0 + \beta_1 RD_{iT} + \beta_2 F_{iT} + C_{yt} + X_{iyt} + \varepsilon_{iyt} \quad (6)$$

Where H_{iyt} is the health outcome of child i from household y in round t. C_{yt} is the household level fixed effect of household y in round t. X_{iyt} are control variables at the child level.

3.6. Results

Tables 2 and 3 present results from the two specifications. In table 2 we present the results from equation (5), with enumeration level fixed effects. Column 1 presents the result of all the children and shows that there is a positive and statistically significant correlation between rainfall deviation and HAZ score. The coefficient suggests that 15% increase (or one standard deviation increase in log rainfall-deviation) in rainfall leads to 0.365 increase in height for age score, which means better rainfall means taller children for a given age. Coefficient of flood dummy is not significant, suggesting no clear relationship between excessive rainfall during gestation period and its impact on child's HAZ. The data also suggests that HAZ scores are better for girls compared to boys, which means that girls under five years of age in Malawi are closer to the global standards of height for age than Malawian boys under five. Age of the child seems to have a non-linear significant relationship with the HAZ scores; HAZ scores are decreasing in age and the decline is at a diminishing rate. This means, as the age increases, the average Malawian child is slowly moving away from the global average of height for age metrics.

We further find that children who participated in the under-five government clinic seem to have lower height for age as expected. It is likely that only those children visited the clinics who were not healthy and therefore have a lower HAZ score. Participation in government's under five nutrition program does not significantly affect HAZ scores. Household head's age or gender are not significant, however, household heads that have completed post graduate are more likely to have positive effect on their children's health, probably due to more information or through the higher income channel. Children covered in the second round (Year 2016) have significantly higher HAZ scores compared to children in the first round of data in 2010. This may be a sign of a developing country like Malawi experiencing higher incomes and better healthcare over time. We have also controlled for the birth year and birth month. As close to 85% of our sample and approximately same percentage of total population of Malawi lives in rural areas, in column 2 we restrict our analyses to focus only on rural households. All the coefficients have similar magnitude and significance in column 2 as it was in column 1 as rural sample contributes heavily to the total sample.

Columns 3 and 4 test our conceptual framework of whether the effect of such shock persists for all or do wealthier parents provide enough positive reinforcements to their children to counter the effect of negative weather shocks in the gestation period. As we do not have a clear estimate of income of the households, we proxy their income by construction material for their houses. To keep it simple, we categorized households based on their type of construction of dwelling. We define poor households as those whose houses are made of non-permanent material like, mud, thatched roof etc., and we define non-poor as those whose houses are made of more permanent structures like concrete etc. Again we restrict our results only to rural areas. In column 3 we present the results of children who belong to households that are considered poor and live in rural areas. We find that for poor households the magnitude of the effect of weather shock on HAZ score is higher than the overall sample. This suggests less coping mechanism for the income constrained households to provide positive reinforcements to their children post birth to counter the effect of gestational weather shock.

As the age of the child increases she gets exposed to positive or negative reinforcements, based on the income constraints of her household. If the parents are poor, they will not be able to provide nutritious food and adequate healthcare to counter the effect of the gestational weather shock, exacerbating the negative effect of the shock as time passes by. On the other hand, the effect of the negative shock will likely fade away if her parents do not have income constraint and are able to provide her the necessary requirements for better health. We test this idea by estimating the effect of gestational weather shock on children up to 3 years old and children who are older than 3.

In column 5 and 6, we present the results of children up to three years old. Column 5 shows the results for rural poor households suggesting that rainfall deviation is significant and higher in magnitude for HAZ scores. Same is true of children belonging to not poor households as shown in column 6. The magnitudes are very comparable suggesting that in the initial years, the effect of gestational weather shock persists among both rich and poor.

In column 7 and 8 we present the results for children aged above 3 years (3-5 years). Column 7 represents children from poor households and we find the effect of gestational weather shock still persisting. On the other hand, we have the results of not poor households in column 8 and we do not find any significant effect of the shock on these children. This suggests that in-utero shocks seem to persist over time when these in no positive support provided to counter it but seems to fade away in the presence of positive reinforcement over time.

To control for unobserved heterogeneity at the household level, we present in table 3 results with household level fixed effect. The results are similar to table 2, with rainfall deviation positively and significantly affecting HAZ scores, but with a higher magnitude. Interestingly, in this specification, we find negative significant effect of excessive rainfall (the variable flood is actually +1 SD deviation above normal rainfall). This is expected, as excessive rainfall can cause multiple disruptions in agricultural production and increase the chances of infection to negatively affect the health of pregnant women causing a shock to the in-utero baby. The results in this specification also holds true across poor and not poor households.

3.7. Conclusion

This paper presents evidence of negative relationship between lower rainfall or excessive rainfall during gestational period and the health of the child between the age of 0-5 years. We identify the shocks as rainfall fluctuation in the gestational period as compared to the average annual rainfall. We also test the hypothesis that whether such effects fade out with time. We found that effects of these shocks stay till some age, but after that children who have access to better resources are likely to cope up better and the effects fade away. However, for children who belong to income constrained households, these effects persist until at least 5 years of age and probably much later. The evidence provided by this study is suggestive of the need for public policy interventions targeted to expectant mothers during periods of extreme weather shocks, and continued support to mother and child after birth, especially for children born in income constrained households in the event of rainfall shocks. Short run minimization of impacts during episodes of adverse shocks should target maternal health.

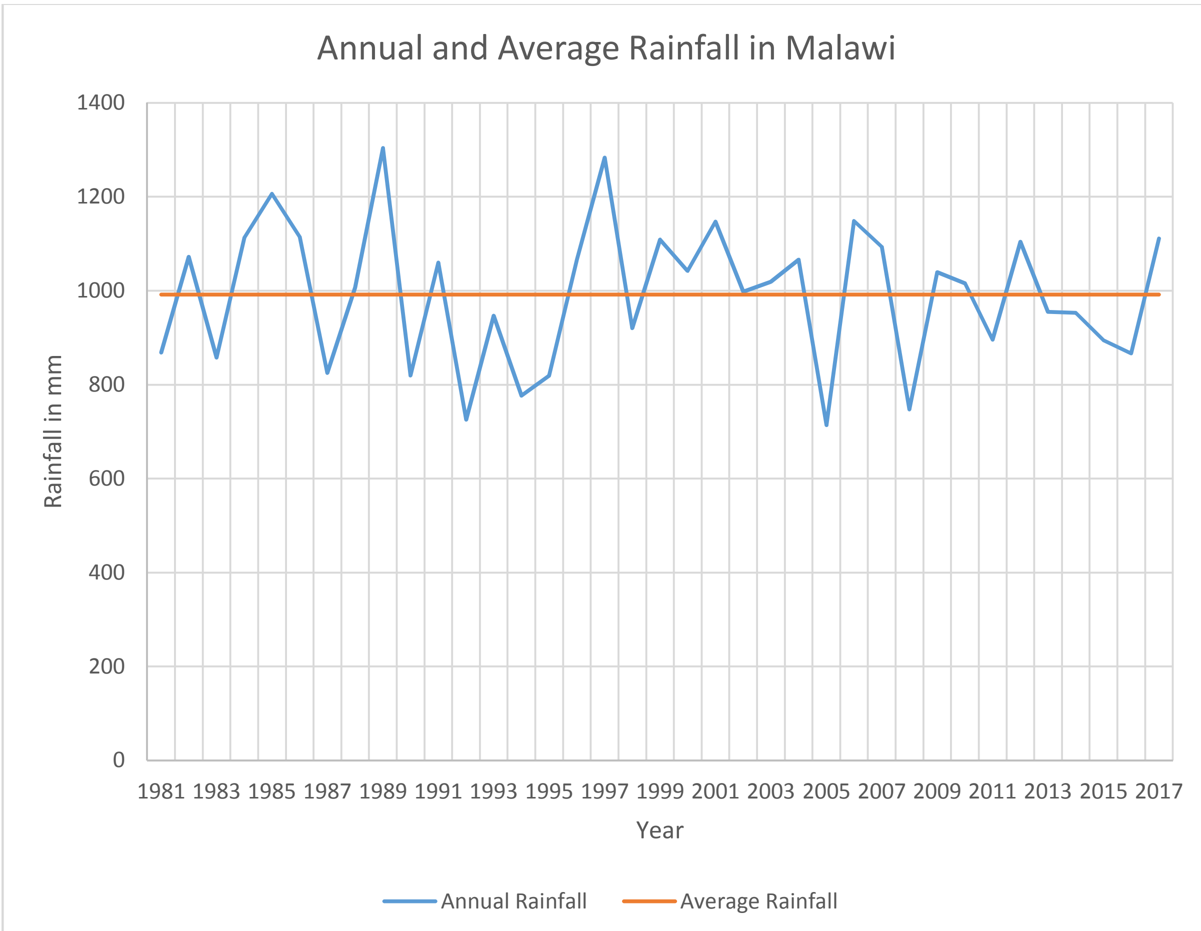
APPENDICES

APPENDIX A: FIGURES

Figure 3.1: MALAWI PROVINCES AND DISTRICTS MAP

Source: Google Maps

Figure 3.2: ANNUAL AND AVERAGE RAINFALL FOR ALL OF MALAWI



Source : Authors Compilation

APPENDIX B: TABLES

Table 3. 1: DESCRIPTIVE STATISTICS

Variable	Obs	Mean	Std. Dev.
Height for Age Z-score	13,277	-1.20	1.44
Weight for Age Z-score	13,277	-0.53	1.10
Weight for Height Z-score	13,277	0.20	1.32
Percentage of children stunted	13,277	29	0.46
Age of child in years	13,277	3.19	1.30
Age of HH Head (years)	13,274	36.19	11.35
Percentage of Male Children	13,277	49.06	.499
Percentage of Male Headed Households	13,274	0.81	0.39
Household Size	13,277	5.46	1.99
% HH received coupons for government sponsored Input subsidy program	13,277	33	0.47
% Poor Household (As defined by their type of house)	13,277	45	0.50
% HH With electricity	13,277	8	0.27
% Household in Urban Areas	13,277	16	0.36
Average Distance to nearest road metal (KM)	13,277	9.38	11.36
Average Distance to Population Centre (20000+ people)	13,277	35.80	22.83
Average Distance to Agricultural Development and Marketing Corporation Centre	13,277	8.46	7.07
Rainfall log-deviation in the past 12 months	13277	-.03	0.15

Table 3.2: EFFECTS OF IN-UTERO RAINFALL SHOCKS ON CHILD HEALTH: ENUMERATION AREA/VILLAGE FIXED EFFECTS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Total Sample	All Rural	Rural-Poor	Rural-Not Poor	Rural-Poor-upto 3 Years	Rural-Not Poor-upto 3 Years	Rural-Poor-4 Years and Above	Rural-Not Poor-4 Years and Above
Rainfall Deviation	0.365**	0.317**	0.747***	0.095	1.130**	1.240**	0.748*	-0.207
	(0.157)	(0.160)	(0.233)	(0.267)	(0.530)	(0.621)	(0.409)	(0.446)
Flood	-0.072	-0.051	-0.205*	-0.036	-0.372	0.156	-0.099	0.043
	(0.070)	(0.073)	(0.114)	(0.113)	(0.241)	(0.262)	(0.195)	(0.188)
Gender of the Child(Female)	0.168***	0.153***	0.161***	0.158***	0.301***	0.212**	0.053	0.107
	(0.033)	(0.034)	(0.050)	(0.056)	(0.086)	(0.097)	(0.089)	(0.092)
Age of the child in Years	-0.776***	-0.770***	-0.790***	-0.692***	-1.535***	-0.381	-0.051	-0.072
	(0.098)	(0.104)	(0.158)	(0.159)	(0.400)	(0.463)	(0.162)	(0.151)
Age Squared	0.107***	0.096***	0.101***	0.080***	0.301***	0.025		
	(0.014)	(0.015)	(0.023)	(0.023)	(0.097)	(0.108)		
If the child participate in a nutrition program	-0.000	-0.002	-0.070	-0.079	-0.029	-0.010	0.156	-0.165
	(0.075)	(0.072)	(0.101)	(0.114)	(0.158)	(0.184)	(0.192)	(0.161)
If the child participate in an under five clinic	-0.210***	-0.199***	-0.126*	-0.195**	-0.062	-0.201	-0.163	-0.226**
	(0.046)	(0.050)	(0.071)	(0.077)	(0.146)	(0.160)	(0.113)	(0.113)
Household Head Age	-0.001	-0.001	-0.004	0.001	-0.001	-0.002	-0.006	0.005
	(0.002)	(0.002)	(0.003)	(0.003)	(0.006)	(0.005)	(0.005)	(0.004)
Household Head Gender (Female)	0.015	0.030	0.087	0.021	0.013	0.088	0.152	-0.173
	(0.051)	(0.051)	(0.074)	(0.070)	(0.113)	(0.128)	(0.128)	(0.115)
Household Head's Education = 2, PSLC	0.002	0.021	-0.023	0.059	-0.092	-0.014	-0.044	0.101
(Base=Illiterate)	(0.058)	(0.060)	(0.101)	(0.086)	(0.165)	(0.158)	(0.153)	(0.144)
JCE	0.079	0.022	-0.054	-0.026	-0.030	-0.082	-0.021	0.029
	(0.060)	(0.069)	(0.120)	(0.101)	(0.188)	(0.183)	(0.174)	(0.162)
MSCE	0.081	0.091	0.140	0.138	0.114	0.044	0.137	0.149
	(0.075)	(0.083)	(0.173)	(0.118)	(0.301)	(0.214)	(0.328)	(0.171)
Non-Univ Diploma	0.208	0.228	-1.015***	0.229	-1.184***	0.280	-1.077	0.218
	(0.168)	(0.189)	(0.353)	(0.193)	(0.367)	(0.293)	(1.261)	(0.312)

Table 3.2 (cont'd)

	0.217	0.242	-0.352**	0.331		0.167	0.903***	0.331
	(0.198)	(0.336)	(0.147)	(0.411)		(0.716)	(0.347)	(0.460)
Postgrad degree	0.853*	1.580***	1.867***	1.925***		1.786***	1.647***	
	(0.509)	(0.197)	(0.166)	(0.330)		(0.472)	(0.300)	
Household Size	0.020*	0.023*	0.031*	0.023	0.015	0.016	0.057*	0.002
	(0.012)	(0.013)	(0.019)	(0.017)	(0.032)	(0.032)	(0.031)	(0.026)
Credit Availability to the Household	-0.019	0.006	-0.046	0.025	-0.074	0.037	-0.153	-0.030
	(0.046)	(0.047)	(0.082)	(0.073)	(0.123)	(0.132)	(0.136)	(0.110)
HH Distance in (KMs) to Nearest ADMARC Outlet	0.010	0.007	-0.011	-0.019	-0.015	-0.016	0.016	-0.012
	(0.021)	(0.021)	(0.030)	(0.032)	(0.043)	(0.054)	(0.050)	(0.051)
HH Distance in (KMs) to Nearest Road	-0.013	-0.012	-0.021	-0.031	-0.011	-0.031	-0.058	-0.047
	(0.018)	(0.019)	(0.025)	(0.030)	(0.046)	(0.053)	(0.047)	(0.040)
HH Distance in (KMs) to Nearest Population Center with +20,000	-0.028**	-0.030**	-0.012	-0.048**	-0.002	-0.028	-0.028	-0.071**
	(0.012)	(0.012)	(0.018)	(0.020)	(0.032)	(0.032)	(0.049)	(0.032)
If the household received Coupons from govt for agricultural Input	0.025	0.043	-0.010	0.037	0.026	0.140	-0.015	-0.017
	(0.043)	(0.043)	(0.065)	(0.068)	(0.102)	(0.114)	(0.113)	(0.104)
Round 2 (Year=2016)	3.455***	3.160***	0.860*	3.642***	1.260	5.431***	-0.348	-0.767
	(0.387)	(0.385)	(0.478)	(0.640)	(0.845)	(0.925)	(1.094)	(0.998)
Birthyear = 2006	-0.082	-0.123	-0.071	-0.179			-0.082	-0.109
(Base Birthyear=2005)	(0.108)	(0.122)	(0.176)	(0.199)			(0.245)	(0.266)
Birthyear = 2007	-0.003	-0.144	-0.079	-0.311			-0.242	-0.231
	(0.143)	(0.148)	(0.215)	(0.233)			(0.327)	(0.352)
Birthyear = 2008	-0.060	-0.239	-0.245	-0.325	0.100	0.291	-1.642*	0.383
	(0.177)	(0.184)	(0.268)	(0.293)	(0.201)	(0.262)	(0.908)	(1.050)
Birthyear = 2009	0.101	-0.149	0.065	-0.469	0.526*	0.528		
	(0.204)	(0.211)	(0.307)	(0.344)	(0.310)	(0.390)		
Birthyear = 2010	-0.037	-0.397	-0.478	-0.453	-0.166	0.415		
	(0.292)	(0.270)	(0.397)	(0.443)	(0.408)	(0.506)		
Birthyear = 2011	-3.087***	-2.785***	-0.343	-3.278***			0.904*	0.497
	(0.255)	(0.258)	(0.389)	(0.419)			(0.468)	(0.435)
Birthyear = 2012	-3.184***	-2.962***	-0.742**	-3.198***			0.247	0.493
	(0.210)	(0.210)	(0.329)	(0.338)			(0.339)	(0.329)
Birthyear = 2013	-3.064***	-2.850***	-0.489*	-3.190***	-1.018***	-3.689***	0.445*	0.340

Table 3.2 (cont'd)

	(0.172)	(0.170)	(0.270)	(0.275)	(0.385)	(0.597)	(0.248)	(0.269)
Birthyear = 2014	-2.861***	-2.737***	-0.324	-3.178***	-0.554*	-3.402***		
	(0.139)	(0.143)	(0.224)	(0.232)	(0.300)	(0.479)		
Birthyear = 2015	-2.792***	-2.764***	-0.321*	-3.231***	-0.409*	-3.309***		
	(0.101)	(0.102)	(0.166)	(0.169)	(0.212)	(0.392)		
Birthyear = 2016	-2.476***	-2.487***		-2.998***		-2.818***		
	(0.092)	(0.097)		(0.195)		(0.421)		
Birthmonth =February	-0.014	-0.028	0.009	0.004	-0.086	0.059	0.122	-0.077
(Base Birthmonth= January)	(0.074)	(0.076)	(0.115)	(0.125)	(0.193)	(0.240)	(0.201)	(0.194)
Birthmonth = March	-0.034	-0.047	-0.011	-0.095	-0.139	0.176	0.027	0.014
	(0.070)	(0.073)	(0.115)	(0.112)	(0.195)	(0.224)	(0.195)	(0.218)
Birthmonth = April	-0.027	-0.034	-0.034	-0.115	-0.102	0.048	-0.164	-0.152
	(0.076)	(0.076)	(0.120)	(0.112)	(0.201)	(0.222)	(0.207)	(0.181)
Birthmonth = May	0.044	0.042	0.121	-0.041	0.021	0.064	0.111	0.086
	(0.080)	(0.087)	(0.118)	(0.134)	(0.198)	(0.248)	(0.216)	(0.211)
Birthmonth = June	0.141*	0.084	0.077	0.102	-0.007	0.317	0.068	0.054
	(0.084)	(0.083)	(0.120)	(0.134)	(0.198)	(0.263)	(0.218)	(0.216)
Birthmonth = July	-0.045	-0.050	-0.103	0.075	-0.211	0.429	-0.250	-0.077
	(0.080)	(0.085)	(0.118)	(0.139)	(0.193)	(0.270)	(0.201)	(0.203)
Birthmonth = August	0.005	0.006	0.082	-0.094	-0.096	0.445*	-0.063	-0.174
	(0.075)	(0.079)	(0.122)	(0.125)	(0.196)	(0.248)	(0.237)	(0.205)
Birthmonth = September	0.045	0.090	0.223*	-0.082	0.152	0.190	0.230	-0.130
	(0.075)	(0.080)	(0.123)	(0.123)	(0.193)	(0.245)	(0.259)	(0.203)
Birthmonth = October	0.045	0.055	0.026	0.009	-0.079	0.203	-0.072	0.102
	(0.084)	(0.089)	(0.135)	(0.128)	(0.203)	(0.233)	(0.248)	(0.206)
Birthmonth = November	0.123	0.098	0.176	0.018	0.143	0.173	0.117	0.161
	(0.083)	(0.086)	(0.124)	(0.135)	(0.191)	(0.257)	(0.229)	(0.207)
Birthmonth = December	0.260***	0.248***	0.252**	0.141	0.365*	0.618***	0.096	-0.247
	(0.083)	(0.085)	(0.127)	(0.129)	(0.209)	(0.229)	(0.230)	(0.217)
Constant	0.443	0.882	0.533	1.938*	2.576	-0.462	0.454	2.285
	(0.503)	(0.544)	(0.687)	(1.062)	(15.538)	(1.634)	(1.888)	(1.670)
Observations	13,269	11,203	5,632	5,571	3,288	3,016	2,344	2,555
R-squared	0.263	0.262	0.358	0.361	0.468	0.492	0.506	0.542

*Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions have enumeration level fixed effect and errors are clustered at enumeration level.*

Table 3. 3: EFFECTS OF IN-UTERO RAINFALL SHOCKS ON CHILD HEALTH: HOUSEHOLD FIXED EFFECTS

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	All Sample	Poor	Non-Poor	Rural	Rural- Poor	Rural- Not Poor
Rainfall Deviation	0.587*	0.903*	0.237	0.528	1.006**	-0.128
	(0.342)	(0.474)	(0.452)	(0.357)	(0.444)	(0.524)
Flood	-0.341**	-0.320	-0.334	-0.353**	-0.413*	-0.247
	(0.149)	(0.224)	(0.220)	(0.154)	(0.218)	(0.241)
Gender of the Child (Female)	0.117	0.039	0.165	0.101	0.052	0.125
	(0.073)	(0.097)	(0.107)	(0.078)	(0.098)	(0.115)
Age of the child in Years	-0.775***	-1.115***	-0.435	-0.874***	-1.170***	-0.532*
	(0.194)	(0.289)	(0.269)	(0.205)	(0.288)	(0.306)
Age Squared	0.078***	0.115***	0.040	0.083***	0.113***	0.049
	(0.029)	(0.044)	(0.041)	(0.031)	(0.044)	(0.047)
If the child participated in a nutrition program	-0.208	-0.201	-0.233	-0.225	-0.229	-0.219
	(0.185)	(0.284)	(0.266)	(0.191)	(0.282)	(0.265)
If the child participated in an under-five clinic	-0.290**	-0.229	-0.361**	-0.275**	-0.242	-0.295
	(0.120)	(0.169)	(0.163)	(0.126)	(0.167)	(0.185)
Birthyear = 2006	-0.333	-0.371	-0.234	-0.295	-0.419	-0.101
(Base Birthyear=2005)	(0.311)	(0.310)	(0.539)	(0.239)	(0.327)	(0.366)
Birthyear = 2007	-0.534	-0.743	-0.288	-0.574	-0.866*	-0.196
	(0.388)	(0.462)	(0.665)	(0.363)	(0.482)	(0.557)
Birthyear = 2008	-1.001**	-1.445**	-0.495	-1.152***	-1.658***	-0.490
	(0.452)	(0.599)	(0.727)	(0.432)	(0.609)	(0.608)
Birthyear = 2009	-0.684	-1.012	-0.288	-0.885*	-1.308*	-0.362
	(0.516)	(0.735)	(0.826)	(0.503)	(0.742)	(0.706)
Birthyear = 2010	-0.930	-1.711*	-0.164	-1.242*	-2.012**	-0.359
	(0.650)	(0.917)	(1.003)	(0.646)	(0.927)	(0.917)
Birthyear = 2011	-3.371***	1.055	-3.546***	-3.330***	1.388	-3.496***
	(0.473)	(0.900)	(0.718)	(0.472)	(0.884)	(0.698)
Birthyear = 2012	-3.619***	0.529	-3.539***	-3.661***	0.853	-3.556***
	(0.412)	(0.740)	(0.664)	(0.406)	(0.737)	(0.613)

Table 3.3 (cont'd)

Birthyear = 2013	-3.413***	0.616	-3.256***	-3.475***	0.905	-3.249***
	(0.383)	(0.605)	(0.667)	(0.366)	(0.589)	(0.575)
Birthyear = 2014	-3.723***	0.448	-3.601***	-3.907***	0.581	-3.733***
	(0.480)	(0.461)	(0.790)	(0.477)	(0.455)	(0.714)
Birthyear = 2015	-3.604***	0.412	-3.419***	-3.862***	0.502	-3.662***
	(0.529)	(0.380)	(0.859)	(0.534)	(0.364)	(0.811)
Birthyear = 2016	-3.669***		-3.091***	-4.034***		-3.387***
	(0.619)		(0.975)	(0.623)		(0.931)
Birthmonth =February	0.047	0.070	0.120	0.107	0.099	0.230
(Base Birthmonth = January)	(0.160)	(0.230)	(0.235)	(0.165)	(0.233)	(0.243)
Birthmonth = March	-0.148	-0.235	0.029	-0.086	-0.213	0.139
	(0.176)	(0.245)	(0.245)	(0.182)	(0.249)	(0.254)
Birthmonth = April	0.004	0.200	-0.139	0.053	0.174	-0.053
	(0.182)	(0.262)	(0.234)	(0.190)	(0.261)	(0.249)
Birthmonth = May	0.026	0.156	0.019	0.056	0.187	0.037
	(0.179)	(0.259)	(0.264)	(0.189)	(0.266)	(0.275)
Birthmonth = June	0.049	0.041	0.128	0.077	0.015	0.225
	(0.194)	(0.290)	(0.278)	(0.210)	(0.295)	(0.316)
Birthmonth = July	0.087	-0.092	0.352	0.092	-0.099	0.368
	(0.202)	(0.281)	(0.293)	(0.214)	(0.285)	(0.316)
Birthmonth = August	0.116	0.296	0.111	0.164	0.256	0.210
	(0.180)	(0.285)	(0.237)	(0.187)	(0.283)	(0.252)
Birthmonth = September	0.191	0.346	0.074	0.276	0.364	0.191
	(0.191)	(0.285)	(0.274)	(0.202)	(0.291)	(0.289)
Birthmonth = October	0.093	0.060	0.175	0.155	0.015	0.390
	(0.184)	(0.241)	(0.301)	(0.191)	(0.245)	(0.305)
Birthmonth = November	0.411*	0.309	0.622**	0.421*	0.332	0.672*
	(0.217)	(0.295)	(0.316)	(0.230)	(0.299)	(0.359)
Birthmonth = December	0.282	0.103	0.516*	0.286	0.049	0.607*
	(0.192)	(0.260)	(0.295)	(0.204)	(0.267)	(0.324)
Constant	2.216***	1.149	1.389	2.587***	1.385*	1.573

Table 3.3 (cont'd)

	(0.708)	(0.743)	(1.123)	(0.729)	(0.735)	(1.109)
Observations	4,867	2,337	2,530	4,230	2,241	1,989
R-squared	0.714	0.719	0.722	0.713	0.723	0.714

*Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All regressions have household level fixed effect and errors are clustered at enumeration area level.*

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CHAPTER 4: DO SMALLER STATES LEAD TO MORE DEVELOPMENT? EVIDENCE FROM SPLITTING OF LARGE STATES IN INDIA

4.1. Introduction

The advent of the new millennium saw the creation of three new states in India -- Chhattisgarh, Uttarakhand and Jharkhand, carved out from the parent states of Madhya Pradesh, Uttar Pradesh and Bihar, respectively. There is a wide literature about the underdevelopment of smaller regions within the larger state and how division of states on social and ethnic lines can lead to a higher level of homogeneity in the resultant states. Various sociological, political, economic and administrative arguments have been made in favor of such splits (Tillin, 2013). One of the rationales for splitting a large state into smaller states is that the earlier neglected (or pockets of underdeveloped) regions of the parent state (that retained the original name), will develop faster under the newly defined state, due to smaller administrative boundaries for both the parent state and the newly formed state. Second, the government and the administration would be more responsive to people's needs due to the democratic framework and therefore there will be more development in both the states. An economic argument in favor of such splits is that the newly formed states will need new sources of finances, and thus create policies to attract new industries, which will bolster growth.

Preceding arguments have implications for policy decisions made against and in favor of forming a new state. However, what is missing in the discussion around the formation of new states are the arguments associated with the developmental outcomes of the split. One of the questions that needs to be explored is how new states perform in relation to the indicators of human development once they split from the parent state, and whether the parent state benefits or loses from the split. In this study we try to explore how creation of the three new states have led to changes in the quality of lives of its people and the various mechanisms that could have led to such changes. There are no studies to our knowledge that have rigorously examined the post-split development impacts of the split that happened in India in 2000 and has continued to happen since then. Such evidence can support/refute the argument of new state formation on the grounds of economic development (underdevelopment) within the smaller states and neutral or positive (negative) impacts on the parent states. Looking at the formation of new states with a dimension of human development can help theorize if and what might be the outcomes of such a split for the affected population in both new and parent state in terms of development indicators. Such theorization can also have implications for policy analyses that drive decisions on future territorial reorganization (Tillin, 2013).

As states are the proximate determinants of local institutions driving development outcomes, a change in their boundaries provides us an opportunity to evaluate the impact of these shifts on the provision of public goods and distribution of development outcomes. However, shifting of state borders or creation of new states are rare, and the case of creation of three new states in India in November 2000, provides us with a rare opportunity to test these development hypotheses. This paper contributes to the literature by providing rigorous evidence of the longer-term developmental impacts of the creation of the three states on the new and the parent state. We consider this split as an exogenous shock and apply difference-in-difference analysis, examining socioeconomic outcomes among people living in the new state and the parent state. To further the argument, we also use a geographical regression discontinuity analysis to see the changes in development indicators on people living in districts on both sides of the newly formed state borders. As a preview of our results, the analyses confirm the hypothesized positive impact of the split on the new states on a wide range of development indicators. However, we find that the split had a negative impact on the parent state. This finding is contrary to our expectation and has never been considered as an argument against splitting a large state.

This paper is organized as follows. Section 2 explains the formation of Indian states and the history behind it. Section 3 provides the rationale for and against such a division along with different hypotheses about potential outcomes of the creation of new states. Section 4 discusses the data sources. Section 5 describes the general econometric frameworks used to test the predictions. Section 6 describes the empirical results. Section 7 covers robustness checks where we test the assumptions of our empirical strategies, followed by conclusion in Section 8.

4.2. The Case of Formation of New States Through Splitting of Larger States

4.2.1 Examples from Other Countries

In most federations, it is easier to change the status of a subunit – for instance from territory to a fully-fledged state than to alter boundaries. Nevertheless, most federal systems have created new sub-units by reorganizing the boundaries of existing states at some stage. This continues to be an active subject of debate, especially in newer federations. The most extreme example of federal restructuring is that of Nigeria, which created thirty-six states from the three regions it started out when it became independent (Suberu 2001). Brazil established the new state of Tocantins, and upgraded Amapa and

Roraima to full statehood in 1988 when a new constitution was approved after the end of the military regime (Souza 1997). In 1999, Canada created the province of Nunavut from its Northwest Territories as a means of accommodating Inuit claims for a homeland and for their rights to manage the natural resources. In 1979, Switzerland created the new canton of Jura after a referendum. These are some of the few examples of new units with political boundaries formed from splitting larger units or a major re-organization of an earlier structure.

4.2.2 Formation of States in Post-independence India: Historical Roots and Current Status

India gained its independence from British occupation in the year 1947 and one of the most immediate tasks lying ahead for the first Indian government was to consolidate the country and create a national identity. India as we know it today, was a myriad collection of more than 521 princely states (some historians put it at 565) and they all varied widely in terms of size and status. At one end of the scale were the massive states of Kashmir and Hyderabad, each the size of a large European country; at the other end, tiny chiefdoms or *jagirs* of a dozen or less villages.

On the eve of Independence, India also went through a very violent division leading to the creation of Pakistan. The turmoil of partition made the Union parliament very skeptic of creating mini entities within the country that could further ask for separate countries. As a result, the Union government monopolized all the rights to reorganize the political structure of the country and till date reserves the right to the formation of a new state or altering the boundaries of an existing state. Despite the existence of several demands for the formation of numerous states, the national leadership in the initial years after independence dissuaded from conceding to demands for the creation of smaller regional states. While the ruling party Congress had promised linguistic provinces before Independence, the country now faced a very critical situation resulting from partition. The creation of linguistic provinces, then, had to be deferred until such time as India was strong and sure of herself. In 1956 the States Reorganization Act was passed which abolished the provinces and princely states in favor of new states which were based on language and ethnicity. Creation of new states and restructuring of existing states continued in the sixties, with the prominent splits of the Bombay State into the present day Gujarat and Maharashtra (in 1960), and the carving out of the Hindi-speaking Haryana state from the southern districts of Punjab state (in 1966). During the next three decades, longstanding demands for the smaller states remained in limbo. A number of issues kept policymakers from implementing further division of states in India. Reminiscent of 'partition anxiety', many fear the rise of regional and linguistic fanaticism as threats to national unity and integrity. A global surge in ethno-nationalist conflicts over the years served to rekindle these fears of Balkanization of India.

However, in November 2000 the government of India succumbed to the demands and three new states were created: Chhattisgarh was created out of eastern Madhya Pradesh; Uttarakhand was created out of the mountainous districts of northwest Uttar Pradesh; and Jharkhand was created out of the southern districts of Bihar (Figures 1 and 2). After another 14 years, in 2014, the government gave approval for Telangana to separate from Andhra Pradesh to become the 29th state of the union.

Due to lack of data we are not able to study the development impacts of the splits that had happened long time ago (i.e., the split of Gujarat-Maharashtra and Punjab-Haryana in the 1960s) or very recently (Telangana-Andhra Pradesh in 2014). Instead, we focus the analysis of this paper on the splits that happened in 2000 with the formation of Chhattisgarh, Uttarakhand and Jharkhand. It is relatively recent and data are available to study the impacts of this split of three larger states that led to the creation of three new states.

4.2.3 The Formation of Three New States by Splitting Larger States in 2000: Driving Forces

The formation of the state of Jharkhand, constituting the 18 districts of southern Bihar, was the fulfillment of a fifty-year struggle for the creation of a heavily tribal state. The boundaries of the new state were less extensive than the originally-conceived Jharkhand, embracing tribal hill areas of Madhya Pradesh, Orissa, and West Bengal, in addition to southern Bihar. The newly formed state took 35 percent of the population of Bihar--India's second most populous state--but, with its coal mines and steel mills, it captured 65 percent of the state's revenue. In the census of 1991, Bihar had 7.7% tribal population mostly concentrated in the southern districts which eventually led to creation of Jharkhand. According to the census of 2011 Bihar was left with 0.9 % of its population being tribal. On the other hand, 27% of the population of the newly formed Jharkhand constituted of tribal population leading to a more homogenous Jharkhand.

The state of Madhya Pradesh was reorganized with the creation of the state of Chhattisgarh, constituting the seven eastern districts of the old state. The division here was rooted in caste distinctiveness, with upper caste peasant Brahmins and Kurmis and Tribals leading the movement for a separate state. Rich in mineral wealth and an important rice-producer, Chhattisgarh had resented its disproportionately large contribution to state revenues but little investment from the state to the region. The new state had a substantial tribal population, and was also driven by tribal demands, as was the creation of Jharkhand.

The formation of the state of Uttarakhand, carved out from the state of Uttar Pradesh (U.P.), fulfilled long-voiced demands by the people of the Kumaon and Garhwal hills of northwestern U.P. for a separate state based on cultural, social (caste), and economic distinctiveness. In Uttarakhand the central justification of demand for statehood was that policies formulated in the plains of Uttar Pradesh were often inappropriate for the distinct topography of the hills and their natural resource base. The eleven hill districts and two plains districts that formed the new state had long-felt neglected by the U.P. state government (Mawdsley, 2002).

These three new states that emerged after the spilt in 2000--Uttarakhand, Jharkhand and Chhattisgarh, are of the size of a small European country in terms of area and population(Jharkhand 32 million ,Portugal 10 million, Netherlands 17 million, Belgium 11 million). Therefore, this change can be considered a huge change in the federal structure of India. Such massive changes are usually an outcome of multiple processes and covers a wide range of political and administrative reasons. The first locates the pressure to create new states within statehood movements that have articulated a sense of cultural identity and regional deprivations. Second explanation revolves around political motives of the ruling parties that might have considered it to be politically beneficial for them. The third rationale suggests that territorial reorganization is driven by capitalist expansion and the desire to intensify resource extraction in the context of economic liberalization. The final explanation is concerned with the administrative efficiency gains due to reducing the size of the states to improve governance.

There are undeniable aspects of all these four explanations that led to the creation of these new states; but we argue that some of them explain the process much better than others. The political economy argument about capitalist expansion resulting in state creation does not hold much ground on the account of multiple factors. First there is considerable diversity in the interests among business and industry. Second, there is enough evidence of industrialists being ambivalent about the creation of new states as many were not supporting the cause due to the fear of increased rent seeking by the new political elites.[1] The second argument of political mileage by the party ruling in the center which decided on the split also does not gain too much traction as it not only badly lost the very next general elections by a massive margin but also another subsequent election in 2009 (Sachar, 2009).

We contend that the important factor which lead to the creation of these 3 new states is a continuing part of federal reorganization in which new states are created to better represent the subnational diversity. Indian federalism represents a collection of diverse identities reflected in the form of different states and following this line of thought the creation of these three states reflect the logic of political representation of diversities that were not well accommodated in the existing states structure. In this case particularly, creation of new states gave better representation to tribal populations in Jharkhand and Chhattisgarh and to an otherwise socio-culturally different group in the case of Uttrakhand (Stepan, 2011). Eminent historian

[1] For instance, Tillin (2013) reports that the leading industry from Jharkhand - TATA industries was of the view that they were better off without the split as the politics was far from them and they were ‘kind of neglected which was better for them’; referring to the higher rent seeking due to creation of new state.

Ramachandra Guha in his book '*India after Gandhi*' suggests that creation of Jharkhand and Chattisgarh can be considered as an official acknowledgment of the history of tribal suffering. Also, the formation of Uttarakhand from the hill districts of Uttar Pradesh fits this narrative as it was rich in natural resources and similar to 'tribal' suffering, was exploited by powerful external interests (Guha, 2007). Guha further argues that Indian republic is still young enough to create more states. 'Regions that have cultural, ecological and historical coherence and are adversely affected by their current status as a part of a larger unit, should be granted statehood' (Kumar,2000). Another noted parliamentarian and political scientist Rasheeduddin Khan calls for territorial reorganization to divide 'sprawling huge states' that perpetuates inequalities. He argues for the creation of units that are socio-culturally homogenous and administratively and politically manageable (Khan,1997).

The final explanation for the creation of states is based on administrative efficiency. This echoed in the 'official' rationale offered by the political leadership that administered the change. As this bill was discussed in the parliament, the home minister at that time L. K. Advani explained that the states were being created on the grounds of 'administrative and economic viability' as well as the 'overwhelming aspirations of the people of the region' (Tillin, 2013). According to professor Ashish Bose at the Institute of Economic Growth, the strategy of reducing the size of the states is key to providing better public services (Menon). We argue that this partly explains and justifies the splitting of the states. Our findings of better service delivery by public institutions in the new states further substantiates this argument.

The end of resistance action by the ethnic groups and their mainstreaming into the larger political process by the creation of the new states echoes greater political decentralization. In all the three states, the leaders of the political struggle for the statehood ended up becoming the

Chief Ministers (elected head of the state government). While in Jharkhand and Chhattisgarh the Chief Ministers came from the local tribal communities, in Uttarakhand there were two chief ministers jointly appointed, each one of them representing different regions of the newly formed state (Singh 2000). This gave people of the states a sense of representation, as now the masses could identify themselves with the ruling political representatives. In this paper we explore whether this sense of representation translates into better service delivery by the governments leading to better developmental outcomes for the new state, and whether the parent state also benefits from the reduced size and efficiencies.

4.3. Concepts and Theories Underlying the Rationale for and Against the Formation of a New State and Research Hypotheses

We consider the borders of the states within a federal system as a form of institution, underpinned by patterns of social, political and economic power. State boundaries help structure political and economic life by determining which groups are in competition with each other over distribution of resources as well as determining which resources are at stake. As institutionalist theories would suggest, the location of state boundaries help to reinforce and reproduce patterns of power. The formation of a new state has its origins in challenging the existing power structures. It offers a possibility of creating new types of regional polity in which different groups might find prominence, cultural and ethnic groups might find more direct control over resources and different relationships might be negotiated between the governments and people.

So, creation of a new state acts as a vehicle for formation of new institutions that are more likely to serve its citizenry better.

4.3.1 Pro- and Anti-Split Arguments

Several arguments have been put forward in the literature in favor of the formation of new states (from an existing large state). First, the creation of a smaller state unleashes the suppressed growth potentials of the hitherto peripheral regions of a large state. It provides an opportunity for the earlier neglected (or pockets of underdeveloped) regions of the parent states to develop faster under the newly defined states.

Second, comparatively smaller but compact geographical entities tend to ensure that there is better democratic governance, as there is greater awareness among the policy makers about the local needs. Smaller states provide gains for the electorates in terms of better representation of their preferences in the decisions by the government. Geographically compact states mean key decisions will be taken closer to the ground. It makes more sense if the decision on key issues of a district in Himalayas (Uttarakhand) is taken in Dehradun (the capital of the new state) which is 50 km away, compared to in Lucknow (the capital of the parent state) which is 500 kilometers away (Kumar, 2010).

Third, smaller spatial units have linguistic compatibility and cultural homogeneity, which allows for better management, implementation and allocation of public resources in provisioning basic social and economic infrastructure services. A relatively homogeneous smaller state allows for easy communicability, enabling marginal social groups to articulate and raise their voices.

The relationship between social and ethnic homogeneity, and economic growth has been widely studied in the economics discipline. Alesina et al. (1994, 2004) studied the effect of distributive politics on economic growth and showed that higher inequality leads to lowers growth. They find strong evidence of trade-off between economies of scale due to bigger jurisdiction and the cost of heterogeneous population that comes with it. Easterly (2006, 2007) shows how social cohesion is an important factor for creating more responsive institutions leading to economic growth. Furthermore, Easterly (1997) associates low schooling, political instability, underdeveloped financial systems, distorted foreign exchange markets, high government deficits, and insufficient infrastructure in Sub-Saharan Africa to higher level of ethnic fragmentation and the resultant less effective institutions.

On the other end of the spectrum, there are arguments or concerns about splitting the states. First, many fear that such divisions can give rise to regional and linguistic fanaticism, which can be threats to national unity and integrity. Second, many believe that bigger states ensure cohesion and stability, which is good for development; although, there are myriad forms of political violence that go unabated in the big states and can undermine development. Third, smaller states (like mineral rich Chhattisgarh and Jharkhand) are often viewed as being much more vulnerable to the pressures of the corporations and multi-nationals due to their small scale economies and the greed of the newly emergent regional elite (Tillin 2012). Another argument in favor of a larger state (or not splitting it) is that it has many benefits of economies of scale; they have more revenue and are able to implement projects and programs that require more capital.

Whether these benefits of not splitting larger states outweigh the benefits of splitting them is an empirical question we are interested in exploring in this paper.

4.3.2 Research Hypotheses

Based on the arguments for and against the split outlined above, one can hypothesize that the splitting of states can have many effects on both the parent and the new state as shown below in table 1. The table suggests that there could be multiple positive and negative impacts on both the states with varying degree of magnitude. As majority of the impacts seem to be positive in this case, we hypothesize that the overall impact of state splitting on both states will be positive and will be reflected in the developmental indicators. Such development may possibly be credited to smaller administrative boundaries for both the parent state and the newly formed state. The underlying reasoning is that the government and the administration within these parent and new states would be potentially more responsive to people's needs due to the democratic framework and which may consequently lead to more development in both the states. In addition, need for new sources of finances to sustain these states may favor formation, adoption and implementation of policies that favor and attract new industries and business, leading to economic growth and development. A larger state has many benefits of economies of scale; but in a heterogeneous large state, it is highly likely that some sections of the populations will be far from reaping the benefits of such economies of scale. In case of marginalization of underrepresented groups in the existing structure, gaining more political representation in the form of creation of new states can lead to better developmental outcomes for such groups.

In this paper we try to investigate the impact of the creation of the three new states on the developmental indicators like literacy rate, provision of electricity, toilets, concrete houses, infrastructure, etc. of the newly formed state and the parent state. We also make an attempt to investigate the impact of this exogenous shock on provision of goods and services by government (like government health facilities), as it is critical for the development of majority of population especially located in rural area.

Table 2 shows summary statistics for several development indicators—i.e., growth in per capita income, literacy, percentage households with electricity and percentage household with toilets between 2001 and 2011 for all the six states (three parent and three new). On all these indicators, in most cases the new states have fared quite well compared to the parent states. This leads to our second hypothesis which suggests that splitting has been more beneficial for new states as compared to the parent states. However, we do not know if the districts that formed new states, were inherently different from the districts that were left behind in the parent state and that is why they did better after splitting. This might lead to self-selection which makes the simple comparison presented in the table below, less meaningful. To deal with the selection bias issue and to capture the impact of splitting requires credible identification strategies. This is what the present study attempts to do as explained in the empirical strategy section.

One study that has attempted to attribute the impact of this split is the study by Asher and Novosad (2015). They used border regression discontinuity design to show how the new states of Jharkhand, Chhatisgarh, and Uttarakhand have done better after their creation in 2000. They compared villages across the newly formed border (from 10 up to 50KM) using the border as a cutoff point, so that villages in the new state are considered as treatment and villages in parent state are considered as control. They use satellite photos of the earth at night, as a proxy of local economic output, and they show that the border regions were indistinguishable from 1992-1999, and then sharply diverge, with significantly higher light output in the new states. Although nighttime light has been used as a proxy for economic development, in the above study it does not give us much information about the details of development indicators or the provision of public goods. Night time luminosity is only a function of availability of electricity in the area, which is just one of the indicators of development and does not necessarily translate as an indicator of overall growth of the region. As the new states have more coal reserves, they might be generating more electricity, which is usually distributed free in many households and might show up in luminosity index, but that not necessarily means other indicators of developments are doing equally well. As the idea behind splitting of the big states were administrative efficiency and better provision of pubic good there is a need for nuanced indicators to show if there has been any difference due to the splitting. This paper addresses the limitation of the Asher and Novosad (2015) analysis by using micro-data from National family health survey (Demographic Health Survey) examines a broad range of indicators to show the broader impact of state splitting.

4.4. Data

This paper uses the data from nationally representative Demographic Health Surveys to capture a comprehensive picture of development impacts of splitting of states. The Demographic Health Survey is as multi-topic survey with three rounds of data collected in years 1992, 1998 and 2015. This dataset was collected with the purpose of documenting the changes in the lives of Indian households in a society undergoing rapid transition. This dataset gives a good understanding of the effectiveness of the state machinery in provision of public goods like schools, health centers, drinking water, electricity, toilets, government housing, etc. Further it has an in-depth health module that covers health indicators like infant mortality rate, institutional deliveries in government hospitals, provision of health cards, etc. It also covers the details of all the required vaccine which are primarily provided by government agencies and are a very good indicators of the effectiveness of the movement's service delivery measures. Additionally, it also provides information on ownership of consumer durables like television, mobile phone, computer, washing machine, refrigerator and motor vehicle that can act as a proxy for economic wellbeing.

4.5. Empirical strategy

The objective of this paper is to test the two hypotheses presented above that-- 1) The increased autonomy and political representation due to splitting of states has positive effect on developmental outcomes for both the parent and the new states; but 2) the newer states experience relatively more benefits than the parent state We take two *quasi-experimental* approaches to test these hypotheses and to estimate the effects of splitting. First is a *difference-in-difference (DiD*) approach with two specifications (described below), and the second approach is a (geographical) *regression discontinuity (RD)* design that compares districts on both sides of the newly formed border due to splitting of an existing state.

4.5.1 Difference - in - Difference Approach

The quasi experimental method of D-I-D proposed in this paper is in line with the method used by Banerjee and Ghatak (2002) to find out the impact of an agricultural land tenancy program – "operation Barga" on productivity difference in Bangladesh and West Bengal (Banerjee and Ghatak 2002). In their paper, the researchers estimated the impact of the program on West

Bengal (In India) using Bangladesh as a control. Using a similar method, in the present study I use the parent state as control.

The fact that new statehood was granted to Chhattisgarh, Jharkhand and Uttarakhand is largely attributed to an exogenous shock. There are around 25 such popular movements in India for the creation of new states and almost every single big state has some sort of protest going on for a new state. Figure 3 shows all the major mass movements for the creation of new states in India. After three years of unstable governments, in the end of year 1999 a new government was unexpectedly elected with full majority won by National Democratic Alliances (NDA). The victory was associated with a nationwide wave against the congress party government which had ruled most of the states since independence. With the victory in general elections NDA wanted to make popular appeals and chose these three states to be split. Also, as the decision to split a state or alter boundaries of a state are completely controlled by the Union government, these states had a limited say in the overall process used, which makes the shock exogenous. We use two model specifications. In the first specification we use the adjacent states as comparison group and both the new and parent state as two different treatment groups. In the second specification, we consider the parent state as a comparison group and new state as a treatment group. In both these specifications, the outcomes will be compared for before and after the division of the parent state occurred.

In the first specification we use D-I-D with new state and parent state as two treatments and the adjacent states as comparison. For this strategy we use the states of Rajasthan, West Bengal, Odisha and Himachal Pradesh as control states as they have very similar development indicators compared to the three states of Madhya Pradesh, Uttar Pradesh and Bihar. The control states also share borders with one or more of the splitting states, and therefore have many areas that are culturally and linguistically similar. In the late 1980s and 1990s some of these states were clubbed together as least developed states with serious developmental challenges. They were referred as BIMAROU, which is an acronym formed from the first letter of the states Bihar, Madhya Pradesh, Rajasthan, Odisha and Uttar Pradesh, which meant "sick" in Hindi and indicative of the performance of these states. This group of five states together were considered to be dragging down the GDP growth rate in India.

The three control states that we are considering for this strategy -- Odisha, West Bengal and Rajasthan also have major movements in support of splitting the states. India's oldest struggle for a new state is for the creation of Gorkhaland which is a part of West Bengal. Similarly, there has been a long-standing demand by people of western Odisha (Odisha is a control state for us) to have a separate state of Koshal for themselves. Our third control state Rajasthan has also, experienced a popular demand for new state for the western part of the state. All these demands are at least as strong as the ones that led to the creation of three new states we are considering. Our fourth control state, Himachal Pradesh is considered as a control state as it has similar hilly regions as Uttarakhand and has comparable agro-climatic zones and cultural heritage.

We measure the impact of splitting of states on developmental indicators of both the parent and the new state using a difference-in-difference estimator using the following specification.

$$y_{it} = \mu_t + \alpha_D + \beta_1 * \ treatment_1 * post_t + \beta_2 * \ treatment_2 * post_t \ + \beta_3 treatment_1 + \beta_4 \, treatment_2 + \beta_5 \, post_t + \Sigma \, \delta X_t + \ \varepsilon_{it} \qquad \text{--------(1)}$$

The dependent variable y_{it} is a developmental indicator such as the literacy rate, availability of clean drinking water, toilet, concrete house, clean cooking fuel and health insurance provided by government for the household i in survey round t. y_{it} also include the indicators of consumer durables and services like, ownership of television, refrigerator, motor vehicle, computer, mobile phone, washing machine, fan and the Internet. We do not have clear data on income and consumption of the households, so ownership of consumer durables act as a good proxy for them. In these states government is the major provider of health services and therefore we have included a wide range of health indicators to examine if the service delivery of health has changed due to the creation of new states. We include major health indicators like, institutional deliveries in government hospitals (whether the child was delivered in an institutional setting or at home), rate of death of infant under the age of one year. We also include whether the child under the age of 5 is underweight, whether the child is stunted or wasted, and does the household own a health card which is provided by the government system. Also included is the compensation for sterilization as a public policy program to control population and is of high importance given the burgeoning population in these states. Furthermore, we include all the important vaccines and pre-natal support to the pregnant mothers and their children primarily by the government run health systems. We include tetanus shot and iron tablets provided to the pregnant mothers; polio vaccine, measles vaccine, Bacille Calmette-Guerin (BCG) vaccines and vitamin A provided to infants in our analysis.

The right-hand variables include fixed effect for each district α_D and a fixed effect for each round μ_t. There are two treatment variables on the right-hand side where $treatment_1$ indicates whether the district falls under the new state and $treatment_2$ indicates whether the district falls in the parent state. The coefficients $\beta_1\ and \beta_2$ would be the difference-in-difference estimate of impacts of splitting on new and parent state respectively compared to the control state. Note that the values of β_1 *and* β_2 will not tell us whether the difference between the new and parent state is statistically significant or not. It will only tell us if they are statistically significantly different (and the magnitude of the difference) from the comparison districts in the adjacent states. This model will help test the first hypothesis on whether the split had any effect on both the states (parent and newly formed)

In second specification we use D-I-D with new state as treatment and the parent state as comparison. In this second specification we measure the differential impact of splitting of states on developmental indicators of the new state as compared to the parent state using a difference-in-difference estimator with repeated cross section data with district fixed effects. This model specification helps address the second hypotheses of whether the split has benefitted newly formed states more or less than the parent states. Following is the empirical specification used:

$$y_{it} = \mu_t + \alpha_D + \beta_1 \, treatment * post_t + \beta_2 \, treatment + \beta_3 post + \Sigma \, \delta X_{it} + \varepsilon_{it} \text{ --------(2)}$$

The dependent variable y_{it} is a developmental and health outcome as in the earlier specification. The right-hand variables include fixed effect for each district α_D and a fixed effect for each round μ_t. Treatment is a dummy variable that is 0 if the district falls in the parent state and 1 if the district falls in the new state. $post_t$ is an indicator of whether it is a post splitting period so basically it would be 1 for any period after year 2000 and 0 for any period prior to that. The district fixed effects control for district-specific factors that are fixed over time, and the round fixed effects control for factors that vary over time but are common across all districts—

both treatment and control. There are also a series of control variables (the *X*'s) that vary over time and across districts and ε_{it} is the error term. The coefficient β_1 would be the difference-in-difference estimate of impacts of splitting on new state.

4.5.2 Geographical Regression Discontinuity Approach

We use Regression Discontinuity (RD) design as another identification strategy to test hypotheses two. This method uses data only from the districts that fall on both sides of the split boundary lines. The RD method does not require exogeneity of the treatment variable with the outcome variable, and therefore solves the problem of endogeneity arising from cherry-picking of the states that went through division. The literature on RD suggests that it can be analyzed and tested like randomized experiment if variation in the treatment near the threshold is approximately randomized. Which means that all "baseline characteristics"—all those variables determined prior to the realization of the assignment variable—should have the same distribution just above and just below the cutoff (Lee and Lemieux 2009).

We compare the developmental indicators among people living in adjacent districts across both sides of the newly created border. RD solves the identification challenge by assuming that districts around a treatment threshold are similar in all characteristics except for a certain exogenous factor that assigns the treatment to some and not to others. Figure 2 shows both the new and the old states with the newly formed boundaries between them in yellow. All the districts sharing this boundary are part of our regression discontinuity analysis.

From existing literature, we know that before the new states were created, the socioeconomic differences across the border were minimal; caste and tribal identities differed, but public goods, population, economic output and agro-climatic-environments were the same on both sides of the not-yet-created states (Asher and Novosad 2015). To test and verify this, we conduct a balancing test and compare the outcome variables of interest, for districts on both sides of the borders in the pre-split era, i.e., for the year 1998-99. Table 3 reports the results of this balancing test, which suggests that there is no significant difference in the baseline variables across the yet-to be formed state lines prior to the split. This justifies our use of the geographic regression discontinuity method. As the federal government decided which districts will go to new states and which ones will stay with the parent states it also takes care of the basic requirement of an RD design that the threshold variable cannot be manipulated by the beneficiary of the treatment.

Following Imbens and Lemieux (2008) we use local linear regression and cover all the districts on both sides of the newly formed borders. We keep the specification very similar to specification (2), but now the treatment only includes the households in the new states which reside in the bordering district to the parent state and the control households are those which live on the other side of the newly formed border in the parent states. Following is the specification we use for the RD analysis:

$$y_{it} = \mu_t + \alpha_D + \beta_1\, treatment\_RDD * post_t + \beta_2\, treatment_{RDD} + \beta_3 post + \Sigma\, \delta X_{it} + \varepsilon_{it}$$

--------(3)

Where y_{it} is a household level developmental outcome of household i in district D and time *t*. X_t is the vector of household level controls. The term, $treatment\_RDD$ is a dummy variable indicating that the households fall in a bordering district across the newly formed state and ϵ_{it} is the household level error term. The coefficient β_1 would be the RDD estimate of impacts of splitting on new state.

4.6. Results

The results for all three models--two specifications of DiD and one of RD for the main variables of interest are summarized in Tables 4-7. Detailed results of all the models for all the indicators across all the states (three parent and three newly formed states) are included in appendix. Table 4 reports the impact of splitting of the states on the newly formed states and the parent states on important household level developmental indicators. For most of these indicators related to dwelling characteristics, the results indicate a significant positive effect of the split on the new states, but an opposite effect on the parent states. The effect on the level of education (as measured by the education attained by the head of the household), the effect is positive for the new state but only in the RD model. The effect of the split on access to electricity was significant and positive for both the parent and the new states; although the effect size is much larger for the new states when compared with adjacent states. The probability of having electricity increased by 16% for the households in the new state post-split compared to the adjacent states, but there is only a 5% increase in the probability of households in parent states compared to the adjacent states. As expected, in the specification where parent states are the comparison and new state is the treatment, we find that the probability of having electricity increases by 10.5% for a household residing in the new states compared to the parent states. The outcome of the RD analysis also suggests that the bordering districts which fall in the new state have done better compared to the districts on the other side of the border in parent states in terms of electricity. The households in the new state are 8% more likely to have electricity compared to their comparison households in the other side of the newly formed borders.

Similarly, the likelihood of getting piped drinking water in their residence is also higher by 7 percentage points for the new states as compared to the adjacent states, however for the parent state it decreases by close to 10%. When we compare the new state and the parent state, we find that the new state is doing better as households in the new state are 2% more likely to have piped drinking water compared to the households in parent state. Similarly, when we compare the districts across the newly formed borders, using RD specification, we find that households in the new state side are 3% more likely to have piped drinking water in their houses as compared to their neighboring district households across the border.

The difference between new state and parent states is more remarkable in the case of concrete housing. While the households in new states are 16% more likely to have a concrete housing, households in the parent states are 21% less likely to have a concrete housing; compared to the adjacent states. This is suggestive of the fact that more economic activity has happened in the new states post-split and probably there is a decline in the same in parent state. Further, when we compare just the new state and parent state we find that compared to the parent state, about 5% more households in the new states lived in a concrete house (Table 4).

The availability of a toilet and clean cooking fuel in the households follow similar trend as concrete housing, with new states outperforming the parent state. It is worth noticing that on both these indicators, not only the new states are doing better compared to the adjacent states, but the parent states are doing worse compared to the adjacent states after the split.

Government plays a significant role in the development of infrastructure underlying the provision of these basic amenities, sometimes more directly than others. For instance, piped drinking water, electricity, and clean cooking fuel are only provided by government institutions and an increases access to these basic amenities and facilities in the new states makes a case for an effective and accountable functioning of the government mechanism. Further, the households in new states are doing better than their counterparts in terms of having concrete housing and having the basic necessity of a toilet. In many cases these toilets and concrete houses are constructed under the ongoing massive federal programs and household doing better on these indicators are indicative of either better government engagement with people or of better economic condition of the households. It is worth noticing that the households in same districts before splitting of the state had lower access to a concrete house, electricity and clean cooking fuel (Appendices).

Table 5 reports the outcomes for ownership of consumer durables and household goods that reflect household income or purchasing power. The results show mostly negative effects for the parent state and a slightly mixed picture for new states. Compared to adjacent states, the parent state is worse off on most of these indicators except ownership of computer (e.g., access to Internet, mobile phone, TV, motorcycle, fan, refrigerator, and washing machine). In general, the new states are doing better compared to the parent states. There was hardly any internet in India prior to the year of split, but post-split the households in new states have done better than the adjacent state by 3% points, while the households in parent states are lagging behind the adjacent states by 1%. When we compare the parent state and new state households, the latter are 4% more likely to have internet in 2015-16 survey. The difference is starker in the RD specification where we see that the households in the new states' bordering districts are 7% more likely to have internet than their counterparts across the border in the parent state in the post-split period (Table 5).

Household's ownership of television and refrigerators follow a similar trend with new states doing better than old states. A household in the new state is 10% more likely to have both TV and refrigerator, while a household in the parent state is 19% less likely to have a TV and 11% less likely to have a refrigerator compared to the adjacent states, post-split. Using other specification, we find household's ownership of TV is better in new state, but we do not find any significant difference in ownership of refrigerators. The results are similar for ownership of fans and mobile phones. However, using adjacent state as comparison, we find that the new states are doing much worse in terms of ownership of computers and washing machines. In the case of washing machines, they are even worse than the parent states (Table 5).

Moving to the important health indicators in table 6, we find that both new and parent states have done better in most aspects compared to the adjacent states, while the parent states have done better on some indicators, on other indicators they have faltered. Results suggest that a household in a new state is 8% more likely to have government provided health insurance while a household in parent state is 19% less likely to have such insurance when compared with households in the adjacent states. The trend continues across other specifications, where we find that a household in new state is 27% more likely to have the government provided health insurance when compared to a similar household in the parent states. In the RD specification, we find that households in the bordering districts of the new state are 20% more likely to have the insurance compared with a similar household across the border, post-split.

Another important child health variable is the number of deliveries in an institutional setting like a hospital or a public health center. As these institutions are more likely to have better hygienic facilities leading to significant risk of mother and infant mortality, it is important to see how both the new and old states are doing on this parameter. We find that a child born in both new and parent state is 9% more likely to be born in a government institution post-split. Using other specifications, we find that children in new states are more likely to be born in a government institution compared to parent state, post-split. Further, children born in new states are more likely to survive their first year in the new states as compared to the adjacent states. There is no significant difference between, adjacent states and parent states on child survival. There is a marginal increase of 2% in the probability of child survival in the bordering district of new states compared to children on the other side of the border.

On other important child health outcomes such as stunting, wasting and underweight, we find mixed results; suggesting new states doing better in some but not on others, and same is true with parent states. The probability of a child being underweight in both parent and new state is 4% less compared to a child from adjacent states, post-split. Across other specifications, children in new states are less likely of be underweight compared to children in the parent state.

Stunting is associated with an underdeveloped brain, with long-lasting harmful consequences, including diminished mental ability and learning capacity, poor school performance in childhood, reduced earnings and increased risks of nutrition-related chronic diseases, such as diabetes, hypertension, and obesity in future. While India’s economy has been growing at impressive rate, the country still has the highest number of stunted children in the world (i.e., 46.8 million children) representing one-third of the global total of stunted children under the age of five (UNICEF India, 2017). Stunting starts from pre-conception when an adolescent girl and who later becomes mother is undernourished and anemic; it worsens when infants' diets are poor, and when sanitation and hygiene are inadequate. It is irreversible by the age of two and an indicator of long term child health. In our analysis we find that a child born in new states is 3% less likely to be stunted compared to children in adjacent states. For parent state we do not find any significant difference from adjacent states, suggesting they are doing as good as other comparable states. Surprisingly, we find that when we compare the children in new states with children in parent states, we find that the likelihood of the child being stunted is 5% higher for those in the new states. The effect reverses, when we compare children in the neighboring districts across the borders, with children in new states doing better by 6% compared to children from parent states.

Wasting is an outcome of shortage of adequate nutrition in short duration and is indicative of a short-term shock, in contrast to stunting, which is regarded as chronic malnutrition. Wasting could be an outcome of a temporary agricultural or other shock in the new states and does not necessarily mean that the nutritional levels of children in parent and new states are different. On wasting parameter, we find that the parent states have done better than the adjacent states while the new states are not significantly different from the adjacent states. Comparing the children across the borders in RD specification, we find that children in the new states have done better.

Next, we analyze the availability of health cards provided by government, which signals the outreach of government's provision of health services. We find that both parent and new states have done better on this front post-split compared to adjacent states; new states have done much better than parent states. The government of India runs sterilization programs among women to control the burgeoning population and they pay a compensation to the women. The results on our analysis suggest that women in new states are 3% more likely to get the compensation, while a woman from the parent state is 6% less likely to get compensation compared to women in adjacent states. Further, the women in the new states bordering districts are 3% more likely to get the compensation, suggesting that the health system there is less corrupt and more effective.

In table 7 we look at access to child health services and nutrition programs. These include availability of different vaccines, vitamin A tablets, and iron supplements for children and pregnant mothers. These services are provided by government health facilities. The results show that compared to adjacent states, the probability of getting all four doses of polio, BCG and Measles for children is much higher in the new states. The children in parent states have also followed the same trend and their probabilities of getting measles vaccine, BCG vaccine and vitamin A tablet have also increased compared to adjacent states in post-split period. But the likelihood of getting polio shots has decreased in the parent state. This suggests that the health systems in both parent and new states have done better ex post to the split. Pregnant mothers in both parent and new states follow similar trend and are doing better in terms of getting tetanus shots and iron tablets during pregnancy post-split.

Tables 8, 9, 10 and 11 present the summarized results at the state level to explain the state-wise heterogeneity and similarities in the results. The detailed tables are presented in Appendix D. Table 8 reports the results of major developmental indicators and consumer durables. Column 1 of table 8 compares Jharkhand to its erstwhile state Bihar using a difference in difference approach. Column 2 compares the districts across the newly formed borders using RD approach. Similar results for other four states are presented in columns 3-6. The table suggest that a household in Jharkhand is 11% more likely to have electricity compared to a household in its parent state Bihar.

Furthermore, a household in the border districts of Jharkhand are 13% more likely to have electricity compared to their neighbors on the other side of the border, post-split. Households in Chhattisgarh also experience a surge in electricity provision post-split as shown in columns 3 and 4. We find an increase in electricity connections in the households in Uttarakhand post-split using the D-i-D approach where we compare Uttarakhand to its parent state Uttar Pradesh, but we do not find any significant improvements in the bordering districts.

Next, the availability of piped drinking water and toilets has increased for all three newly formed states using either of the specification as suggested by table 8. The improvements are marginal for Jharkhand and Chhattisgarh, but significant for Uttarakhand. Housing shows a mixed result with improvements seen in Chhattisgarh using both the specifications, but for Jharkhand only the D-i-D shows increase in concrete housing while for Uttarakhand, D-i-D specification shows increase in the overall state and RD shows decline in the bordering districts. For clean cooking fuel, there is not a huge variation among states as all the three new states show slight improvement. For consumer durables like television, we find that all three new states have done better, but Chhattisgarh and Uttarakhand have done significantly better compared to Jharkhand. Both Uttarakhand and Chhattisgarh experienced a huge surge in internet penetration compared to their parent states. On the other hand, Jharkhand actually experienced a decline in this indicator. For other consumer durables like refrigerator and motorcycle, we find in most cases the new states have done slightly better without much heterogeneity in the results. In general, we find that all three newly formed states have done better than their parent states post-split with some amount of heterogeneity across various indicators. The overall results do not seem to be driven by skewed results in any one state.

Table 9 presents the results for DiD estimator using the adjacent states as comparison group. Column 1 shows the changes in development indicators for the newly formed state Jharkhand as compared to adjacent states that did not go through any split; Odisha and West Bengal. Similarly, columns 2-6 present state-wise results for two new and three parent states comparing them with their adjacent states after the split. Columns 1 and 2 suggest that after the split a household in Jharkhand is 12% more likely to have electricity as compared to the adjacent state, while a household in Bihar does not have any significant change in the availability of electricity after the split as compared to the nearby states. Both these states experienced an improvement in piped drinking water but the magnitude of improvement for Jharkhand is marginally higher than Bihar. In the case of concrete housing, households in Jharkhand experienced an increase in the possibility of having a concrete house by 11% while a household in Bihar there was a decline by 1% compared to the adjacent states. Similarly, we see an increase in availability of toilet for households in Jharkhand and a decline in availability of toilet amongst households in Bihar post-split when we compare them to the adjacent states. The trend of positive growth in Jharkhand and a decline in Bihar persists for clean cooking fuel, internet and other important consumer durables.

In columns 3 and 4 we compare Chhattisgarh and Madhya Pradesh with their adjacent states of Maharashtra, Andhra Pradesh, Gujarat and Rajasthan. The results in columns 3 and 4 are similar to columns 1 and 2, where we saw that the newly formed state performs better compared to the adjacent states while the parent states did worse. Chhattisgarh shows improvement in electricity, concrete housing, toilets, clean cooking fuel and other consumer durables while Madhya Pradesh shows a decline in piped drinking water, concrete housing, toilet, clean cooking fuel and most consumer durables when compared with the adjacent states post-split. Similar results exist for Uttarakhand and Uttar-Pradesh with Uttarakhand doing better in most developmental indicators while Uttar Pradesh condition seems to be worsening compared to the adjacent states of Himachal Pradesh, Haryana and Rajasthan. Overall, table 9 shows a very clear image of how the new states have done better after split while the parent states done worse, which is very similar to the results we saw in tables 4 and 5. Further, there is heterogeneity between the states for different outcome variables but no clear winner among the new or old states that seems to be driving the results; the results seem similar for all the three new and three parent states.

Table 10 reports the results of major health indicators. Column 1 of table 10 compares Jharkhand to its parent state Bihar using a difference in difference approach. Column 2 compares the districts on both sides of the newly formed borders using RD approach. Similar results for other four states are presented in columns 3-6. Column 1 shows a 5 % increase in the likelihood of a child being born in a government facility in all the three new states if we use the entire parent state as comparison, however, we do not see any significant difference in the RD specification for districts right across the borders. Infant mortality shows a decline for both Jharkhand and Chhattisgarh using either of the specification, but there is no significant difference in Uttarakhand. Malnutrition indicators of stunting, wasting and underweight shows a decline for all three new states when compared with the parent state across at least one specification. Similar results persist for other vaccines like Polio shots, Measles and BCG where the newly formed states seem to be doing better than the parent state in at least one of the specifications and in some case for both the specifications. This suggests that the new states in general have done better than the parent states in important health indicators as already presented in tb,les 6 and 7. Moreover, all the three states have done better in varying degree for different indicators, suggesting heterogeneity in results, but the results are not skewed in favor or against any of the states.

Table 11 presents the D-i-D results of important health indicators in comparison to the adjacent states. This table suggests a mixed result with new states doing better post-split in most health indicators as compared to the adjacent states, but in some cases the parent states have also done better than the adjacent states. For example, infant mortality has gone down in Bihar and Madhya Pradesh significantly, but not in Uttar Pradesh among the parent states, while it has gone down in Jharkhand but not in Chhattisgarh or Uttarakhand. For nutritional indicators of stunting, wasting and underweight, Bihar has done much worse on all three indicators, but Jharkhand shows some improvement in wasting. Both Madhya Pradesh and Chhattisgarh have done better in all three nutritional indicators, suggesting a decline in wasting, stunting, and underweight. Uttar Pradesh shows a decline in underweight and stunting, but an increase in wasting, while Uttarakhand shows a decline in all three. For measles, BCG, tetanus and Polio vaccines we see a general improvement across all the old and new states except Uttar Pradesh. The results in table 11 further explain the results in tables 6-7 at a state level and we do not find any particular pattern for any states to be consistently skewing the results except Uttar Pradesh's performance on vaccination.

4.7. Robustness Check

The difference-in-difference model makes the counterfactual assumption that the treatment districts would grow at the same rate as the control districts if there were no intervention (i.e., division of states). While this assumption is not directly testable, we can test whether the treatment districts and the control districts were growing at the same rate in the pre-intervention period. If we do find that they were growing at the same rate, it would suggest that our counterfactual assumption is likely to be correct. This is an indirect test of the validity of the difference-in-difference assumption that the observed change in the control districts is what would have happened in the treatment districts if there was no intervention.

To test the parallel trends assumption, we use a similar specification as equation (1) but with time dummy variables. The regression model is specified in equation 4.

$$y_{it} = \mu_t + \alpha_D + \beta_1\, treatment * post_{dummy} + \beta_2 treatment + \beta_3 post_{dummy} + \Sigma\, \delta X_{it} + \varepsilon_{it}$$

(4)

We have two rounds of data prior to the splitting of states, so we consider the first round as baseline and second round as end line. We assume a dummy post (round 2) and interact that term with treatment. The hypothesis of parallel trend is rejected if the coefficient β_1 is significantly different from zero.

We present the regression results of testing parallel trend for the two difference-in-difference specification models in Appendix E. For the first DiD model specification we report the regression results for the outcome variables and some covariates in tables B1 and B2. We find that on average the treatment districts in split states and comparison districts in adjacent states were growing at very similar rates prior to the split. For DiD specification model 2 , we find similar results that for household head education, electricity, piped drinking water, toilet, refrigerator, motorcycle, government institutional deliveries, infant deaths, underweight, stunted, wasted, tetanus shots, polio vaccines, BCG vaccines, health cards, iron tables and vitamin A to children there is no significant difference in the trend between treatment and comparison districts prior to the split.

For the regression discontinuity design we had done the balancing test (Appendix E) and do not need to do the parallel trend test. However, there is a possibility that districts across the newly formed borders might be of different sizes on each side leading to some sort of bias and a parallel trend test would make the results more credible. We present the results of this test in tables Appendix E. In this case too we find that the treatment and comparison districts were not changing at a significantly different rate from each other prior to the split. Based on these tests we thus fail to reject the hypothesis that both treatment and comparison districts were growing at a similar rate prior to the split. This increases the confidence in the appropriateness of the use of the DiD and RD identification strategy used in this analysis.

4.8. Conclusion

In a federal system like India, states play an important role in the development of its population and can be considered as a proximate determinant of institutions. In this study we tried to examine whether and how more homogenous states leads to more development. Usually it is very difficult to compare the effectiveness of institutions from different states as they are created by different historical forces. Splitting of states in the year 2000 provided an ideal natural experiment to isolate the impact of government institutions and programs on the development indicators. Once the border appears, only then we could spot the difference created by formation of new states, which earlier was a sub-region within the state. So, creation of this earlier nonexistent state boundary line, allows us use quasi-experimental methods and flesh out the role of newly formed institutions on the developmental indicators of the population. We used quasi experimental methods of difference in difference and regression discontinuity to evaluate the impact of splitting of this states on the new and the parent state and we find that institutions do matter, as the results of this study clearly show how they have functioned to improve the lives of people in the newly formed states once they find more political representation. The parent states are doing significantly better on health indicators (delivery of babies at government facilities, access to health card, vaccination, and child nutrition supplements). But on other indicators of living standards (e.g., amenities, public services, and consumer durables) by and large they have been worse off with the split compared to adjacent states. For example, on 18 out of 29 outcome indicators compared in this study, the parent states experienced, on average, a significant negative change in outcomes after the split compared to the change over the same time period in adjacent states.

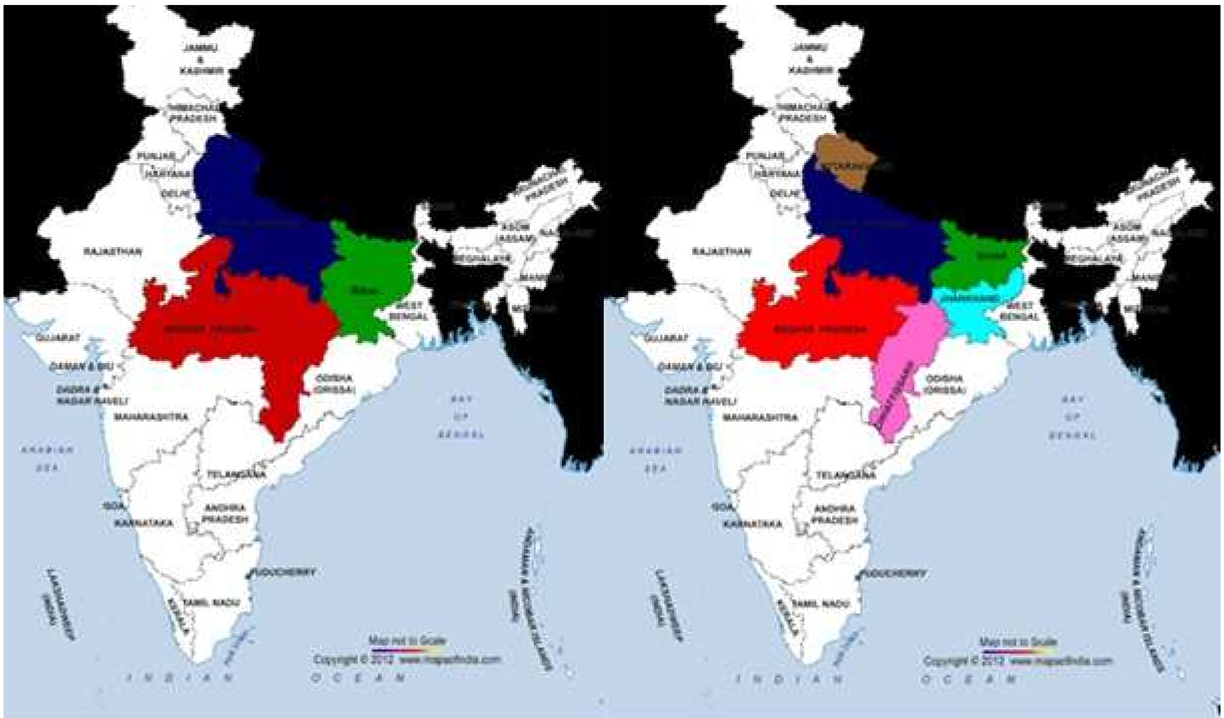
Overall, our findings suggest mixed results. It supports the argument that greater political representation and geographical cohesiveness makes the government institutions more responsive and effective leading to better service delivery and improving the lives of the regional sub groups, at least for the new state resulting from the split. However, such positive impacts are not experienced to the same extent by the parent state on all the development indicators. For the parent state, the negative impact of losing control over revenue generating resources that may be found in areas carved out of the state may be thwarting any positive impact that could come from managing culturally homogeneous compact geographies.

While on major development indicators like electricity, concrete housing, drinking water we find that only the new states have done better while the parent states have done worse, we also find that on various health indicators like vaccines, child health variables (stunting, wasting, underweight) etc. the parent states have also improved, suggesting efficiency. The net aggregate welfare implications of the split for the affected population across both the parent and the new states thus remain ambiguous. This is an interesting research question that is outside the scope of this paper but needs to be addressed in future research. The literature has mostly focused on assessing the impact of the split on the new states, rather than on both the parent and the new states. The findings of potential negative impact of the split on the parent state points to the importance of considering this in future policy decisions on splitting the states not only in India but also in other countries with federal system.

APPENDICES

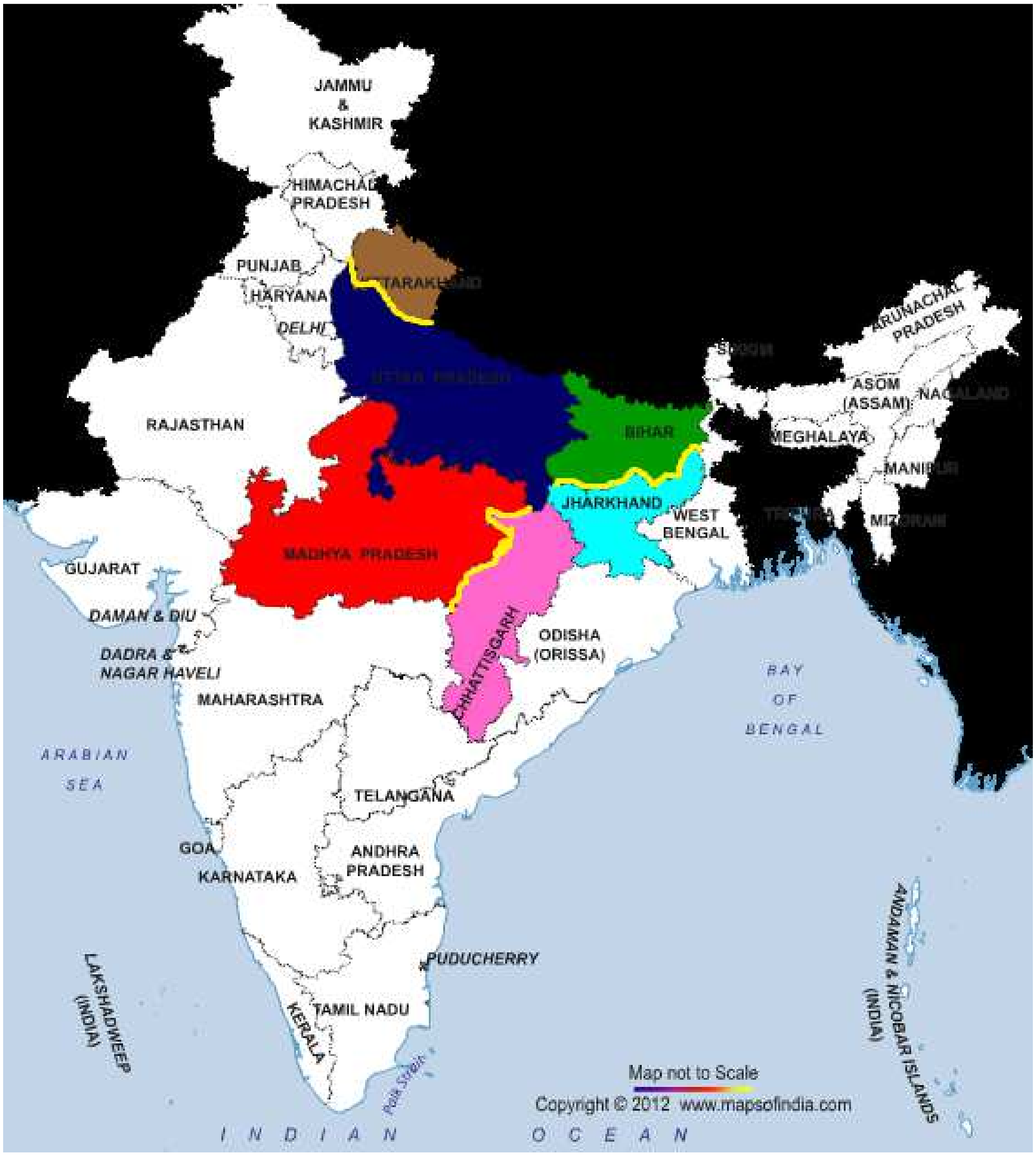
APPENDIX A- FIGURES

Figure 4.1: THREE STATE BEFORE AND AFTER SPLITTING. LEFT MAP CORRESPONDS TO THE THREE STATES BEFORE SPLITTING AND THE RIGHT MAP SHOWS THREE NEW AND THE THREE OLD STATES AFTER SPLITTING.



Source: Government of India website

Figure 4.2: NEWLY CREATED BOUNDARY LINES (IN YELLOW) SHARED BY BOTH NEW AND OLD STATES



Source: Government of India website

Figure 4.3: ASPIRANT STATES OF INDIA REPRESENTING ALL THE CURRENT DEMANDS FOR NEW STATE FORMATION.

Source: India Redrawn: Reorganization of State, 06Februrary 2012, Outlook magazine

APPENDIX B: TABLES- SUMMARY OF RESULTS

Table 4. 1: ARGUMENTS FOR AND AGAINST SPLITTING A LARGE STATE INTO TWO AND THEIR POTENTIAL DEVELOPMENT IMPACTS ON THE PARENT STATE AND THE NEWLY CREATED SMALLER STATES

Arguments for and against	**Potential impact on:**	
	Parent state	**New state**
1. Division unleashes suppressed growth potential	Neutral	Positive
2. Compact geographical entities create policies and environment conducive to local needs	Positive	Positive
3. Cultural homogeneity allows for better management and allocation of public resources	Positive	Positive
4. Smaller size means key decisions will be taken closer to the ground (efficiency in decision making)	Neutral	Positive
5. Increased vulnerability to the pressures of corporations and the greed of newly emergent regional elite	Neutral	Negative
6. Natural resources like coal and minerals etc. are mostly found in the areas carved out in the new states.	Negative	Positive

Source: Author's own compilation

Table 4. 2: CHANGE IN DEVELOPMENTAL INDICATORS FROM YEAR 2001 TO YEAR 2011 FOR BOTH PARENT AND NEW STATES

	Parent State				New State		
Indicators / Year	2001	2011	% increase		2001	2011	% increase
Per Capita Income							
Uttar Pradesh	9,995	30,071	201	Uttarakhand	16,232	85,372	426
Bihar	6,200	22,582	264	Jharkhand	11,034	36,554	231
Madhya Pradesh	12,697	37,979	199	Chhattisgarh	12,170	48,366	297
Electricity in % Households							
Uttar Pradesh	31.90	36.81	15	Uttarakhand	60.33	87.04	44
Bihar	10.25	16.36	60	Jharkhand	24.30	45.78	88
Madhya Pradesh	69.98	67.11	-4	Chhattisgarh	53.10	75.26	42
Literacy rate							
Uttar Pradesh	73.19	87.2	19	Uttarakhand	56.27	67.7	20
Bihar	63.25	72.2	14	Jharkhand	55.52	67.2	21
Madhya Pradesh	90.86	94	3	Chhattisgarh	47	61.8	31
Toilet in % Households							
Uttar Pradesh	19.2	21.8	14	Uttarakhand	31.6	54.1	71
Bihar	13.9	17.6	27	Jharkhand	6.6	7.6	15
Madhya Pradesh	8.9	13.1	47	Chhattisgarh	5.2	14.5	179

Source: Planning Commission of India 2012

Table 4. 3: TABLES OF MEAN COMPARISONS BETWEEN DISTRICTS ON BOTH SIDES OF BORDER SEPARATING THE NEWLY FORMED STATE AND PARENT STATE, 1998-99

Variables	N(Parent states)	Mean(Parent State)	N(New states)	Mean(New States)	Mean Difference
Concrete Housing	2952	0.169	2132	0.168	-0.001
Piped Drinking Water	2952	0	2132	0.002	-0.002
Clean Cooking Fuel	2950	0.088	2129	0.089	0.001
Toilet	2952	0.247	2132	0.241	0.006
Electricity	2952	0.293	2132	0.355	-0.063*
Radio	2952	0.252	2132	0.261	-0.009
Television	2952	0.173	2132	0.206	-0.033
Refrigerator	2952	0.037	2132	0.098	-0.061
Bicycle	2952	0.447	2132	0.472	-0.025
Motorcycle	2952	0.049	2131	0.088	-0.039
Car	2952	0.004	2132	0.014	-0.01
Percentage Hindu	2950	0.223	2132	0.142	0.081*
Percentage General Caste	2697	0.514	2093	0.557	-0.043
Education level of HH	2952	0.928	2132	1.01	-0.082*
Percentage Rural Households	1410	1.88	756	1.87	0.055
% Female headed household	1410	1.048	756	1.069	-0.021
Age of Household Head	1408	45.381	756	44.352	1.03
Women years of Education	1410	1.864	756	1.932	-0.2
Household Size	1410	8.562	756	7.47	.093*
Government Institutional Delivery	1410	0.044	756	0.078	-0.034
Underweight	960	0.535	616	0.518	0.018
Stunted	975	0.633	616	0.645	0.012
Wasted	930	0.271	601	0.265	0.006
Tetanus Shot During Pregnancy	1410	0.596	756	0.668	-0.072
Polio Shot	1410	0.019	756	0.026	-0.007
Measles Vaccine	1410	0.178	756	0.179	-0.001
BCG Vaccine	1410	0.37	756	0.372	-0.002
Health Card	1410	0.357	756	0.405	-0.047
Iron tablets to Pregnant women	1410	0.257	756	0.44	-0.183
Vitamin A tablets to Pregnant women	1228	0.125	675	0.193	-0.068
DPT Vaccine	1410	0.37	756	0.384	-0.014

Source: DHS 1998-99

Table 4. 4: SUMMARY OF REGRESSION RESULTS FOR THE EFFECTS OF SPLITTING ON SELECTED DEVELOPMENTAL OUTCOMES: EDUCATION AND HOUSEHOLD DWELLING CHARACTERISTICS

		(1)	(2)	(3)
	Comparison:	Adjacent states	Parent state	Neighboring districts in parent state
	Estimator:	DiD	DiD	RD
Outcome variable	**Impact on:**			
HHH Education	New state	-0.000	-0.054	0.219**
		(0.083)	(0.079)	(0.111)
	Parent state	0.030	--	--
		(0.043)		
Electricity	New state	0.161***	0.105***	0.082***
		(0.005)	(0.005)	(0.007)
	Parent state	0.054***	--	--
		(0.002)		
Piped drinking Water	New state	0.074***	0.020***	0.033***
		(0.004)	(0.003)	(0.004)
	Parent state	-0.095***	--	--
		(0.002)		
Concrete house	New state	0.158***	0.048***	0.006
		(0.005)	(0.005)	(0.007)
	Parent state	-0.208***	--	--
		(0.003)		
Toilet	New state	0.095***	0.010*	0.035***
		(0.005)	(0.005)	(0.007)
	Parent state	-0.112***	--	--
		(0.003)		
Clean Cooking Fuel	New state	0.109***	0.043***	0.062***
		(0.005)	(0.004)	(0.006)
	Parent state	-0.070***	--	--
		(0.003)		

Source: Author's calculations.
Note: * p<0.1; ** p<0.05; *** p<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

Table 4. 5: SUMMARY OF REGRESSION RESULTS FOR THE EFFECTS OF SPLITTING ON SELECTED DEVELOPMENTAL OUTCOMES: DURABLE GOODS AND AMENITIES

		(1)	(2)	(3)
Comparison:		Adjacent states	Parent state	Neighboring districts in parent state
	Estimator:	DiD	DiD	RD
Outcome variable	**Impact on:**			
Internet	New state	0.027***	0.038***	0.074***
		(0.003)	(0.003)	(0.004)
	Parent state	-0.010***	--	--
		(0.002)		
Television	New state	0.100***	0.091***	0.092***
		(0.006)	(0.005)	(0.008)
	Parent state	-0.19***	--	--
		(0.003)		
Refrigerator	New state	0.100***	0.005	-0.001
		(0.005)	(0.004)	(0.006)
	Parent state	-0.106***	--	--
		(0.003)		
Motorcycle	New state	0.064***	-0.010**	0.037***
		(0.006)	(0.005)	(0.007)
	Parent state	-0.052***	--	--
		(0.003)		
Fan	New state	0.047***	0.051***	0.041***
		(0.005)	(0.005)	(0.008)
	Parent state	-0.10***	--	--
		(0.003)		
Mobile Phones	New state	0.139***	0.025	0.178***
		(0.023)	(0.023)	(0.011)
	Parent state	-0.036**	--	--
		(0.014)		
Computer	New state	-0.047**	0.000	0.043***
		(0.019)	(0.016)	(0.007)
	Parent state	-0.017	--	--
		(0.012)		
Washing Machine	New state	-0.267***	-0.053***	0.051***
		(0.021)	(0.019)	(0.009)
	Parent state	-0.165***	--	--
		(0.013)		

Source: Author's calculations.
Note: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

Table 4. 6: SUMMARY OF REGRESSION RESULTS FOR THE EFFECTS OF SPLITTING ON SELECTED DEVELOPMENTAL OUTCOMES: MAJOR HEALTH INDICATORS

		(1)	(2)	(3)
Comparison:		Adjacent states	Parent state	Neighboring districts in parent state
	Estimator:	DiD	DiD	RD
Outcome variable	**Impact on:**			
Government Health Insurance	New state	0.081*** (0.004)	0.274*** (0.003)	0.204*** (0.005)
	Parent state	-0.194*** (0.002)	--	--
Deliveries at government facilities	New state	0.097*** (0.010)	0.091*** (0.005)	0.061*** (0.012)
	Parent state	0.092*** (0.005)	--	--
Infant Death	New state	-0.02*** (0.005)	0.005 (0.004)	-0.016** (0.007)
	Parent state	-0.004 (0.002)	--	--
Underweight children	New state	-0.041*** (0.012)	-0.010** (0.005)	-0.026* (0.015)
	Parent state	-0.041*** (0.006)	--	--
Stunted children	New state	-0.029** (0.013)	0.051*** (0.005)	-0.06*** (0.016)
	Parent state	-0.010 (0.006)	--	--
Wasted children	New state	-0.002 (0.012)	0.025 (0.023)	-0.06*** (0.015)
	Parent state	-0.07*** (0.006)	--	--
Health Card	New state	0.168*** (0.010)	0.000 (0.016)	0.142*** (0.013)
	Parent state	0.094*** (0.005)	--	--
Compensation for Sterilization	New state	0.032*** (0.006)	-0.053*** (0.019)	0.026*** (0.007)
	Parent state	-0.064*** (0.003)	--	--

Source: Author's calculations.
Note: * p<0.1; ** p<0.05; *** p<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

Table 4. 7: SUMMARY OF REGRESSION RESULTS FOR THE EFFECTS OF SPLITTING ON SELECTED DEVELOPMENTAL OUTCOMES: GOVERNMENT HEALTH PROGRAM INDICATORS FOR CHILDREN AND PREGNANT WOMEN

		(1)	(2)	(3)
Comparison:		Adjacent states	Parent state	Neighboring districts in parent state
	Estimator:	DiD	DiD	RD
Outcome variable	**Impact on:**			
Tetanus shot	New state	0.194***	0.029***	-0.019
		(0.010)	(0.010)	(0.013)
	Parent state	0.165***	--	--
		(0.005)		
Polio Vaccine	New state	0.072***	0.091***	0.035***
		(0.010)	(0.010)	(0.013)
	Parent state	-0.022***	--	--
		(0.005)		
Measles vaccine	New state	0.149***	0.020**	0.034***
		(0.010)	(0.010)	(0.013)
	Parent state	0.128***	--	--
		(0.005)		
BCG vaccine	New state	0.196***	-0.019**	0.067***
		(0.008)	(0.008)	(0.010)
	Parent state	0.217***	--	--
		(0.004)		
Iron tablets	New state	0.195***	0.032***	-0.018
		(0.010)	(0.010)	(0.013)
	Parent state	0.160***	--	--
		(0.005)		
Vitamin A tablets	New state	-0.016	0.028***	0.043***
		(0.010)	(0.010)	(0.013)
	Parent state	0.011**	--	--
		(0.005)		
DPT vaccine	New state	0.197***	0.008	0.031***
		(0.009)	(0.009)	(0.011)
	Parent state	0.190***	--	--
		(0.004)		

Source: Author’s calculations.

Note: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

Table 4. 8: SUMMARY OF STATE-WISE REGRESSION RESULTS FOR THE EFFECTS OF SPLITTING ON SELECTED DEVELOPMENTAL OUTCOMES OF NEW STATES AS COMPARED TO THE PARENT STATES

	(1)	(2)	(3)	(4)	(5)	(6)
New State	Jharkhand		Chhattisgarh		Uttarakhand	
Comparison	Bihar	Bordering Districts of Bihar	Madhya Pradesh	Bordering Districts of MP	Uttar Pradesh	Bordering Districts of UP
Estimator	DiD	RD	DiD	RD	DiD	RD
Outcome Variable						
Electricity	0.11***	0.13***	0.19***	0.08***	0.07***	-0.01
	(0.009)	(0.012)	(0.006)	(0.012)	(0.013)	(0.014)
Piped Drinking Water	0.04***	0.01**	0.09***	0.02***	0.24***	0.26***
	(0.004)	(0.004)	(0.005)	(0.007)	(0.008)	(0.011)
Concrete House	0.04***	-0.00	0.02**	0.13***	0.08***	0.06***
	(0.008)	(0.011)	(0.007)	(0.012)	(0.012)	(0.016)
Toilet	0.11***	0.09***	0.05***	0.17***	0.24***	-0.02
	(0.008)	(0.010)	(0.007)	(0.012)	(0.012)	(0.014)
Clean Cooking Fuel	0.03***	0.05***	0.02***	0.03***	0.01	0.06***
	(0.007)	(0.008)	(0.006)	(0.009)	(0.011)	(0.015)
Television	0.04***	-0.01	0.12***	0.21***	0.16***	0.07***
	(0.008)	(0.011)	(0.008)	(0.014)	(0.014)	(0.017)
Internet	-0.00	-0.02***	0.00	0.07***	0.19***	0.28***
	(0.005)	(0.006)	(0.005)	(0.008)	(0.008)	(0.009)
Refrigerator	0.03***	-0.00	0.00	0.05***	0.10***	0.06***
	(0.005)	(0.007)	(0.006)	(0.009)	(0.011)	(0.016)
Motorbike	0.05***	0.03***	-0.02**	0.12***	-0.03**	-0.01
	(0.008)	(0.010)	(0.008)	(0.013)	(0.013)	(0.017)

Source: Author's calculations.
Note: * *p*<0.1; ** *p*<0.05; *** *p*<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

Table 4. 9: SUMMARY OF STATE-WISE REGRESSION RESULTS FOR THE EFFECTS OF SPLITTING ON SELECTED DEVELOPMENTAL OUTCOMES IN COMPARISON TO THE ADJACENT STATES USING DID ESTIMATOR

	(1)	(2)	(3)	(4)	(5)	(6)
Outcome Variables	Jharkhand	Bihar	Chhattisgarh	Madhya Pradesh	Uttarakhand	Uttar Pradesh
Electricity	-0.01	-0.12***	0.09***	-0.10***	0.17***	-0.10***
	(0.009)	(0.005)	(0.006)	(0.004)	(0.011)	(0.004)
Piped Drinking Water	0.01***	-0.02***	0.09***	-0.00	0.08***	-0.16***
	(0.004)	(0.002)	(0.006)	(0.004)	(0.009)	(0.003)
Concrete House	0.9***	-0.12***	0.14***	-0.15***	0.09***	-0.17***
	(0.009)	(0.006)	(0.008)	(0.005)	(0.012)	(0.005)
Toilet	0.19***	-0.10***	0.05***	-0.10***	0.06***	-0.19***
	(0.009)	(0.005)	(0.008)	(0.005)	(0.011)	(0.004)
Clean Cooking Fuel	0.05***	-0.03***	0.14***	-0.11***	0.01	0.00
	(0.007)	(0.005)	(0.007)	(0.005)	(0.011)	(0.004)
Television	0.21***	-0.25***	0.03***	-0.15***	-0.00	-0.16***
	(0.005)	(0.003)	(0.004)	(0.003)	(0.008)	(0.003)
Internet	-0.02***	- 0.01***	0.08***	0.07***	0.11***	-0.08***
	(0.009)	(0.006)	(0.008)	(0.005)	(0.013)	(0.005)
Refrigerator	0.07***	- 0.09***	0.08***	-0.08***	0.08***	-0.19***
	(0.006)	(0.004)	(0.007)	(0.005)	(0.011)	(0.004)
Motorcycle	0.00	- 0.05***	-0.04***	-0.02***	0.15***	-0.12***
	(0.008)	(0.005)	(0.008)	(0.005)	(0.013)	(0.005)

Source: Author's calculations.
Note: * p<0.1; ** p<0.05; *** p<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

Table 4. 10: SUMMARY OF REGRESSION STATE-WISE RESULTS FOR THE EFFECTS OF SPLITTING ON SELECTED HEALTH OUTCOMES OF NEW STATES AS COMPARED TO THE PARENT STATES

	(1)	(2)	(3)	(4)	(5)	(6)
New State	Jharkhand		Chhattisgarh		Uttarakhand	
Comparison	Bihar	Bordering Districts of Bihar	Madhya Pradesh	Bordering Districts of MP	Uttar Pradesh	Bordering Districts of UP
Estimator	DiD	RD	DiD	RD	DiD	RD
Outcome Variables						
Deliveries at govt. facilities	0.05***	-0.01	0.05***	-0.02	0.05*	-0.01
	(0.016)	(0.019)	(0.012)	(0.024)	(0.025)	(0.028)
Infant Death	-0.03***	-0.02*	-0.03***	-0.02*	0.02	0.01
	(0.008)	(0.010)	(0.007)	(0.013)	(0.015)	(0.017)
Underweight children	-0.14***	-0.16***	-0.09***	-0.06**	-0.05	-0.07**
	(0.019)	(0.023)	(0.015)	(0.029)	(0.031)	(0.036)
Stunted children	-0.07***	-0.12***	-0.09***	-0.03	-0.14***	-0.04
	(0.019)	(0.022)	(0.022)	(0.041)	(0.031)	(0.036)
Wasted children	-0.12***	-0.14***	-0.03	-0.12***	-0.12***	0.03
	(0.017)	(0.020)	(0.020)	(0.039)	(0.025)	(0.030)
Health Card	0.09***	0.01	-0.04***	0.12***	-0.03	0.02
	(0.016)	(0.020)	(0.011)	(0.024)	(0.027)	(0.032)
Tetanus shot	0.05***	0.06***	0.06***	0.06***	-0.02	0.20***
	(0.017)	(0.020)	(0.013)	(0.025)	(0.027)	(0.032)
Polio Vaccine	0.01	0.01	0.12***	0.12***	-0.00	0.08***
	(0.017)	(0.020)	(0.013)	(0.024)	(0.026)	(0.030)
Measles vaccine	0.01	0.01	0.00	0.06***	0.10***	0.21***
	(0.016)	(0.019)	(0.013)	(0.025)	(0.027)	(0.031)
BCG vaccine	0.02*	-0.01	0.02*	0.06***	0.14***	0.28***
	(0.013)	(0.015)	(0.011)	(0.019)	(0.024)	(0.027)

Source: Author's calculations.
Note: * p<0.1; ** p<0.05; *** p<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

Table 4. 11: SUMMARY OF REGRESSION STATE-WISE RESULTS FOR THE EFFECTS OF SPLITTING ON SELECTED DEVELOPMENTAL OUTCOMES IN COMPARISON TO THE ADJACENT STATES USING D-I-D ESTIMATOR.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Jharkhand	Bihar	Chhattisgarh	Madhya Pradesh	Uttarakhand	Uttar Pradesh
Deliveries at govt. facilities	0.05***	0.01	0.15***	0.20***	0.18***	-0.14***
	(0.017)	(0.010)	(0.013)	(0.008)	(0.024)	(0.008)
Infant Death	-0.03***	0.01*	0.02***	-0.00	0.02	0.00
	(0.008)	(0.005)	(0.007)	(0.004)	(0.014)	(0.005)
Underweight children	-0.14***	0.01	-0.13***	-0.04***	-0.13***	-0.08***
	(0.020)	(0.011)	(0.016)	(0.010)	(0.029)	(0.010)
Stunted children	-0.05**	-0.00	-0.09***	-0.04**	-0.16***	-0.02**
	(0.021)	(0.014)	(0.023)	(0.014)	(0.030)	(0.010)
Wasted children	-0.09***	-0.03***	-0.05***	-0.03**	0.04*	-0.07***
	(0.019)	(0.013)	(0.020)	(0.013)	(0.025)	(0.008)
Health Card	0.10***	0.02***	0.15***	0.19***	0.01	0.04***
	(0.017)	(0.010)	(0.013)	(0.008)	(0.025)	(0.008)
Tetanus shot	0.19***	0.14***	0.13***	0.06***	0.00	0.02**
	(0.017)	(0.010)	(0.014)	(0.009)	(0.026)	(0.008)
Polio Vaccine	0.10***	-0.12***	0.13***	0.01	0.08***	-0.08***
	(0.017)	(0.010)	(0.014)	(0.009)	(0.025)	(0.008)
Measles vaccine	0.12***	0.11**	0.09***	0.09***	0.08***	0.02**
	(0.017)	(0.010)	(0.014)	(0.009)	(0.026)	(0.008)
BCG vaccine	0.22***	0.25***	0.09***	0.11***	-0.10***	0.04***
	(0.014)	(0.008)	(0.011)	(0.007)	(0.022)	(0.007)

Source: Author's calculations.
Note: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

APPENDIX C: TABLES – DETAILED RESULTS

Table 4. 12: DEVELOPMENTAL INDICATORS- PARENT STATE AS COMPARISON AND NEWLY FORMED STATES AS TREATMENT

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	HHH Education	Electricity	Piped Drinking water	Concrete House	Toilet	Clean Cooking Fuel	Government Health Insurance
Districts in New states X Post	-0.054	0.105***	0.020***	0.048***	0.010*	0.043***	0.274***
	(0.079)	(0.005)	(0.003)	(0.005)	(0.005)	(0.004)	(0.003)
Post	1.289***	0.345***	0.067***	0.103***	0.170***	0.126***	0.084***
	(0.031)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)
Treatment	0.598	-0.084**	0.310***	-0.041	-0.019	0.143***	-0.074***
	(0.565)	(0.037)	(0.022)	(0.035)	(0.035)	(0.031)	(0.024)
Age of head of household	-0.056***	0.001***	0.001***	0.002***	0.003***	0.001***	0.000***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	-3.790***	0.026***	0.002	0.025***	0.022***	0.027***	-0.004***
(Base = Male)	(0.035)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Education of the Household head		0.010***	0.002***	0.013***	0.015***	0.013***	-0.001***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household Size	-0.026***	0.011***	-0.001***	0.003***	0.004***	-0.005***	0.002***
	(0.004)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rural	-3.101***	-0.218***	-0.170***	-0.427***	-0.449***	-0.473***	0.017***
(Base=urban)	(0.031)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)
Religion of the HH (Muslim)	-2.573***	0.034***	0.005***	0.010***	0.133***	-0.008***	-0.002
(Base= Hindu)	(0.037)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)

Table 4. 12 (cont'd)

Religion of the HH (Christian)	2.382***	-0.016	-0.004	0.047***	0.096***	0.061***	-0.038***
	(0.169)	(0.011)	(0.006)	(0.011)	(0.010)	(0.009)	(0.007)
Religion of the HH (Sikh)	0.879***	0.100***	0.060***	0.138***	0.083***	0.144***	-0.011
	(0.232)	(0.015)	(0.009)	(0.014)	(0.014)	(0.013)	(0.010)
Religion of the HH (Others)	0.838***	0.001	-0.005	-0.030***	0.024***	0.054***	-0.032***
	(0.132)	(0.009)	(0.005)	(0.008)	(0.008)	(0.007)	(0.006)
Caste of the household(Scheduled Caste)	-1.895***	-0.050***	-0.014***	-0.078***	-0.098***	-0.069***	0.020***
(Base= General Caste)	(0.030)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)
Caste of the household(Scheduled Tribe)	-2.350***	-0.076***	-0.026***	-0.123***	-0.127***	-0.087***	0.018***
	(0.044)	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)
Constant	12.555***	0.612***	-0.010	0.589***	0.602***	0.366***	-0.024*
	(0.326)	(0.021)	(0.013)	(0.020)	(0.020)	(0.018)	(0.014)
Observations	264,833	264,833	264,833	264,833	264,833	264,516	264,833
R-squared	0.155	0.344	0.190	0.348	0.418	0.430	0.236

Note: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

Table 4. 13: DEVELOPMENTAL INDICATORS-ADJACENT STATES AS COMPARISON AND BOTH PARENT AND NEW STATES AS TREATMENTS

VARIABLES	(1) HHH Education	(2) Electricity	(3) Piped Drinking water	(4) Concrete House	(5) Toilet	(6) Clean Cooking Fuel	(7) Government Health Insurance
New States X Post	-0.000	0.161***	0.074***	0.158***	0.095***	0.109***	0.081***
	(0.083)	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)	(0.004)
Parent State X Post	0.030	0.054***	-0.095***	-0.208***	-0.112***	-0.070***	-0.194***
	(0.043)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)
Post	1.206***	0.295***	0.160***	0.315***	0.282***	0.196***	0.279***
	(0.028)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)
New States	-2.043***	-0.254***	0.023	-0.240***	-0.276***	0.071***	0.336***
	(0.395)	(0.023)	(0.018)	(0.026)	(0.025)	(0.023)	(0.020)
Parent States	-0.085	-0.017	-0.031***	0.061***	-0.081***	0.045***	0.052***
	(0.200)	(0.012)	(0.009)	(0.013)	(0.013)	(0.012)	(0.010)
Age of head of household	-0.061***	0.001***	0.001***	0.001***	0.003***	0.001***	0.000***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	-3.612***	0.007***	-0.000	0.012***	0.006***	0.017***	-0.003**
(Base = Male)	(0.026)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)
Education of the Household head		0.007***	0.004***	0.012***	0.014***	0.014***	-0.002***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household Size	-0.053***	0.010***	-0.001***	0.004***	0.003***	-0.005***	0.003***
	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rural	-3.051***	-0.136***	-0.147***	-0.335***	-0.371***	-0.434***	0.052***
(Base=urban)	(0.021)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Religion of the HH (Muslim)	-2.380***	0.006***	-0.005***	-0.009***	0.084***	-0.026***	0.003*
(Base= Hindu)	(0.029)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)
Religion of the HH (Christian)	0.861***	0.005	0.004	0.021***	0.010*	0.010**	0.031***
	(0.081)	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)	(0.004)
Religion of the HH (Sikh)	0.375***	0.055***	0.022***	0.083***	0.081***	0.116***	0.004
	(0.141)	(0.008)	(0.007)	(0.009)	(0.009)	(0.008)	(0.007)
Religion of the HH (Others)	0.546***	0.005	0.015***	0.022***	0.048***	0.036***	-0.022***

Table 4. 13 (cont'd)

	(0.063)	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)
Caste of the household(Scheduled Caste)	-1.830***	-0.042***	-0.018***	-0.084***	-0.092***	-0.075***	0.029***
(Base= General Caste)	(0.022)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Caste of the household(Scheduled Tribe)	-2.261***	-0.088***	-0.043***	-0.156***	-0.165***	-0.126***	0.020***
	(0.031)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Constant	12.554***	0.609***	0.003	0.410***	0.587***	0.271***	-0.068***
	(0.329)	(0.019)	(0.015)	(0.022)	(0.021)	(0.019)	(0.017)
Observations	499,138	499,138	499,138	499,138	499,138	497,520	499,138
R-squared	0.161	0.346	0.241	0.394	0.429	0.452	0.307

Note: * *p*<0.1; ** *p*<0.05; *** *p*<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

Table 4. 14: DEVELOPMENTAL INDICATORS- RDD USING DISTRICTS ON THE NEWLY FORMED STATES AS TREATMENT AND PARENT STATE AS COMPARISON

VARIABLES	(1) HHH Education	(2) Electricity	(3) Piped Drinking water	(4) Concrete House	(5) Toilet	(6) Clean Cooking Fuel	(7) Government Health Insurance
New State Border Dist. # Post	0.219**	0.082***	0.033***	0.006	0.035***	0.062***	0.204***
	(0.111)	(0.007)	(0.004)	(0.007)	(0.007)	(0.006)	(0.005)
Post Split	0.946***	0.377***	0.050***	0.142***	0.221***	0.139***	0.102***
	(0.069)	(0.004)	(0.002)	(0.004)	(0.004)	(0.004)	(0.003)
District on the New State Side	-1.595***	0.285***	0.036***	-0.08***	0.039***	0.060***	0.195***
	(0.219)	(0.014)	(0.008)	(0.014)	(0.014)	(0.012)	(0.011)
Age of head of household	-0.057***	0.001***	0.000***	0.002***	0.003***	0.001***	0.000***
	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	-3.658***	0.015***	0.005*	0.034***	0.031***	0.035***	-0.009***
(Base = Male)	(0.067)	(0.004)	(0.002)	(0.004)	(0.004)	(0.004)	(0.003)
Education of the Household head		0.010***	0.002***	0.015***	0.015***	0.013***	-0.001***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household Size	-0.030***	0.009***	-0.00***	0.002***	0.003***	-0.007***	0.004***
	(0.009)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
Rural	-2.958***	-0.220***	-0.16***	-0.42***	-0.39***	-0.421***	0.023***
(Base=urban)	(0.057)	(0.004)	(0.002)	(0.004)	(0.004)	(0.003)	(0.003)
Religion of the HH (Muslim)	-2.970***	0.045***	0.001	0.031***	0.171***	0.000	-0.012***
(Base= Hindu)	(0.067)	(0.004)	(0.002)	(0.004)	(0.004)	(0.004)	(0.003)
Religion of the HH (Christian)	1.633***	-0.009	0.014	0.035**	0.118***	0.060***	-0.023*
	(0.277)	(0.018)	(0.010)	(0.018)	(0.017)	(0.015)	(0.014)
Religion of the HH (Sikh)	0.882***	0.142***	0.011	0.155***	0.093***	0.131***	0.007
	(0.336)	(0.022)	(0.012)	(0.022)	(0.021)	(0.018)	(0.016)
Religion of the HH (Others)	0.396	-0.028*	-0.017*	-0.019	0.016	0.036***	-0.018
	(0.256)	(0.016)	(0.009)	(0.017)	(0.016)	(0.014)	(0.012)
Caste of the household(Scheduled Caste)	-1.737***	-0.043***	-0.01***	-0.09***	-0.1***	-0.061***	0.013***
(Base= General Caste)	(0.060)	(0.004)	(0.002)	(0.004)	(0.004)	(0.003)	(0.003)
Caste of the household(Scheduled Tribe)	-2.106***	-0.078***	-0.01***	-0.13***	-0.12***	-0.073***	0.020***
	(0.076)	(0.005)	(0.003)	(0.005)	(0.005)	(0.004)	(0.004)
Constant	11.882***	0.230***	0.083***	0.358***	0.218***	0.317***	0.026***
	(0.200)	(0.013)	(0.007)	(0.013)	(0.013)	(0.011)	(0.010)

Table 4. 14 (cont'd)

Observations	71,751	71,751	71,751	71,751	71,751	71,702	71,751
R-squared	0.141	0.329	0.219	0.341	0.424	0.392	0.271

Note: * *p*<0.1; ** *p*<0.05; *** *p*<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

Table 4. 15: CONSUMER DURABLES - PARENT STATE AS COMPARISON AND NEWLY FORMED STATES AS TREATMENT

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Internet	Television	Refrigerator	Motorcycle	Fan	Mobile Phone	Computer	Washing Machine
Districts in New states X Post	0.038***	0.091***	0.005	-0.010**	0.051***	0.025	0.000	-0.053***
	(0.003)	(0.005)	(0.004)	(0.005)	(0.005)	(0.023)	(0.016)	(0.019)
Post	0.078***	0.204***	0.088***	0.219***	0.303***			
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)			
Treatment	0.176***	0.081**	0.132***	-0.099***	-0.350***			
	(0.023)	(0.038)	(0.029)	(0.037)	(0.039)			
Age of head of household	0.001***	0.002***	0.002***	0.002***	0.001***	-0.002***	0.001***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	0.011***	0.014***	0.021***	-0.018***	0.021***	-0.018***	0.020***	0.026***
(Base = Male)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)
Education of the Household head	0.006***	0.015***	0.010***	0.015***	0.014***	0.007***	0.007***	0.009***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household Size	0.003***	0.020***	0.006***	0.020***	0.015***	0.026***	0.003***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rural	-0.106***	-0.333***	-0.263***	-0.128***	-0.310***	-0.057***	-0.102***	-0.158***
(Base=urban)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Religion of the HH (Muslim)	-0.024***	-0.077***	0.015***	-0.044***	0.039***	-0.001	-0.031***	0.020***

Table 4. 15 (cont'd)

(Base= Hindu)	(0.001)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.001)	(0.002)
Religion of the HH (Christian)	0.027***	0.029**	0.062***	0.072***	0.023*	0.056***	0.041***	0.049***
	(0.007)	(0.011)	(0.009)	(0.011)	(0.012)	(0.009)	(0.007)	(0.008)
Religion of the HH (Sikh)	0.069***	0.162***	0.244***	0.183***	0.122***	0.054***	0.119***	0.245***
	(0.009)	(0.016)	(0.012)	(0.015)	(0.016)	(0.013)	(0.010)	(0.011)
Religion of the HH (Others)	0.012**	-0.006	0.060***	0.034***	-0.023**	-0.009	0.022***	0.049***
	(0.005)	(0.009)	(0.007)	(0.009)	(0.009)	(0.007)	(0.005)	(0.006)
Caste of the household(Scheduled Caste)	-0.028***	-0.071***	-0.051***	-0.093***	-0.094***	-0.043***	-0.023***	-0.036***
(Base= General Caste)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Caste of the household(Scheduled Tribe)	-0.030***	-0.134***	-0.054***	-0.105***	-0.179***	-0.116***	-0.023***	-0.023***
	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)
Constant	-0.087***	0.319***	0.094***	-0.123***	0.501***	0.904***	0.036***	0.113***
	(0.013)	(0.022)	(0.017)	(0.021)	(0.023)	(0.007)	(0.005)	(0.006)
Observations	264,833	264,833	264,831	264,826	264,830	223,398	223,398	223,398
R-squared	0.139	0.327	0.284	0.213	0.351	0.137	0.129	0.237

Note: * *p*<0.1; ** *p*<0.05; *** *p*<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

Table 4. 16: CONSUMER DURABLES - ADJACENT UNDIVIDED STATES AS COMPARISON AND BOTH PARENT AND NEW STATES AS TWO TREATMENTS

VARIABLES	(1) Internet	(2) Television	(3) Refrigerator	(4) Motorcycle	(5) Fan	(6) Mobile Phone	(7) Computer	(8) Washing Machine
New States X Post	0.027***	0.100***	0.100***	0.064***	0.047***	0.139***	-0.047**	-0.267***
	(0.003)	(0.006)	(0.005)	(0.006)	(0.005)	(0.023)	(0.019)	(0.021)
Parent State X Post	-0.010***	-0.19***	-0.106***	-0.052***	-0.10***	-0.036**	-0.017	-0.165***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.014)	(0.012)	(0.013)
Post	0.089***	0.405***	0.193***	0.279***	0.409***			
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)			
New States	0.059***	-0.129***	-0.275***	0.157***	-0.19***			
	(0.016)	(0.027)	(0.023)	(0.027)	(0.025)			
Parent States	-0.005	0.015	-0.051***	0.013	0.011			
	(0.008)	(0.014)	(0.012)	(0.013)	(0.013)			
Age of head of household	0.001***	0.001***	0.003***	0.002***	0.001***	-0.00***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	0.003***	-0.003	0.011***	-0.039***	0.000	-0.03***	0.013***	0.017***
(Base = Male)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Education of the Household head	0.006***	0.014***	0.014***	0.015***	0.011***	0.007***	0.009***	0.011***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household Size	0.003***	0.023***	0.009***	0.023***	0.014***	0.027***	0.004***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rural	-0.089***	-0.26***	-0.231***	-0.116***	-0.21***	-0.05***	-0.103***	-0.136***
(Base=urban)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Religion of the HH (Muslim)	-0.030***	-0.09***	-0.002	-0.053***	0.016***	-0.01***	-0.037***	0.013***
(Base= Hindu)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Religion of the HH (Christian)	0.004	0.006	0.028***	0.002	0.018***	0.008*	0.021***	0.035***
	(0.003)	(0.006)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)

Table 4. 16 (cont'd)

Religion of the HH (Sikh)	0.042***	0.096***	0.175***	0.144***	0.075***	0.026***	0.082***	0.176***
	(0.006)	(0.010)	(0.008)	(0.009)	(0.009)	(0.008)	(0.007)	(0.007)
Religion of the HH (Others)	0.006**	0.020***	0.041***	0.022***	0.019***	0.001	0.023***	0.042***
	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
Caste of the household(Scheduled Caste)	-0.028***	-0.06***	-0.072***	-0.100***	-0.07***	-0.04***	-0.03***	-0.042***
(Base= General Caste)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Caste of the household(Scheduled Tribe)	-0.028***	-0.15***	-0.088***	-0.11***	-0.18***	-0.11***	-0.023***	-0.026***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)
Constant	-0.072***	0.213***	0.012	-0.131***	0.432***	0.887***	-0.016**	-0.032***
	(0.013)	(0.023)	(0.019)	(0.022)	(0.021)	(0.008)	(0.007)	(0.007)
Observations	499,138	499,138	499,135	499,127	499,132	391,297	391,297	391,297
R-squared	0.144	0.358	0.312	0.234	0.387	0.142	0.143	0.243

Note: * *p*<0.1; ** *p*<0.05; *** *p*<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

Table 4. 17: CONSUMER DURABLES - RDD USING DISTRICTS ON THE NEW STATES AS TREATMENT AND PARENT STATE AS COMPARISON

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Internet	Television	Refrigerator	Motorcycle	Fan	Mobile Phones	Computer	Washing Machine
New State Border Dist. # Post	0.074***	0.092***	-0.001	0.037***	0.041***	0.178***	0.043***	0.051***
	(0.004)	(0.008)	(0.006)	(0.007)	(0.008)	(0.011)	(0.007)	(0.009)
Post Split	0.043***	0.185***	0.094***	0.183***	0.317***			
	(0.003)	(0.005)	(0.004)	(0.005)	(0.005)			
District on the New State Side	-0.010	0.061***	0.082***	0.139***	0.009			
	(0.008)	(0.015)	(0.012)	(0.014)	(0.015)			
Age of head of household	0.001***	0.002***	0.002***	0.002***	0.001***	-0.00***	0.001***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	0.011***	0.017***	0.026***	-0.010**	0.020***	-0.01***	0.018***	0.024***
(Base = Male)	(0.002)	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.002)	(0.003)
Education of the Household head	0.005***	0.015***	0.010***	0.015***	0.015***	0.008***	0.006***	0.009***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household Size	0.002***	0.019***	0.006***	0.020***	0.014***	0.027***	0.002***	0.005***
	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Rural	-0.07***	-0.317***	-0.232***	-0.111***	-0.30***	-0.05***	-0.079***	-0.15***
(Base=urban)	(0.002)	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)	(0.002)	(0.003)
Religion of the HH (Muslim)	-0.02***	-0.126***	0.024***	-0.027***	0.054***	0.012***	-0.025***	0.030***
(Base= Hindu)	(0.002)	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.002)	(0.003)
Religion of the HH (Christian)	0.030***	0.020	0.053***	0.107***	0.006	0.047***	0.048***	0.044***
	(0.010)	(0.019)	(0.015)	(0.018)	(0.019)	(0.016)	(0.010)	(0.013)
Religion of the HH (Sikh)	0.021*	0.181***	0.280***	0.197***	0.169***	0.038*	0.060***	0.313***
	(0.012)	(0.023)	(0.018)	(0.022)	(0.023)	(0.021)	(0.013)	(0.017)
Religion of the HH (Others)	-0.001	-0.015	0.029**	0.016	-0.033*	-0.004	0.027***	0.031**
	(0.009)	(0.018)	(0.014)	(0.017)	(0.018)	(0.015)	(0.010)	(0.013)
Constant	-0.002	0.136***	-0.004	-0.171***	0.223***	0.917***	-0.021***	-0.018**
	(0.007)	(0.014)	(0.011)	(0.014)	(0.014)	(0.011)	(0.007)	(0.009)
Observations	71,751	71,751	71,751	71,750	71,751	61,390	61,390	61,390
R-squared	0.141	0.304	0.255	0.185	0.335	0.149	0.112	0.234

Note: * *p*<0.1; ** *p*<0.05; *** *p*<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

Table 4. 18: MAJOR HEALTH INDICATORS- PARENT STATE AS COMPARISON AND NEWLY FORMED STATES AS TREATMENT

VARIABLES	(1) Govt Institutional Delivery	(2) Infant Death	(3) Underweight	(4) Stunted	(5) Wasted	(6) Health Card	(7) Compensation for Sterilization
Districts in New states X Post	0.004	-0.025***	0.008	-0.011	0.067***	0.071***	0.028***
	(0.009)	(0.005)	(0.011)	(0.013)	(0.011)	(0.009)	(0.005)
post	0.426***	-0.037***	-0.117***	-0.142***	-0.038***	0.301***	0.123***
	(0.003)	(0.002)	(0.004)	(0.004)	(0.004)	(0.003)	(0.002)
treatment	-0.232***	0.018	0.296***	-0.016	0.346***	-0.204***	0.057
	(0.069)	(0.037)	(0.078)	(0.082)	(0.070)	(0.069)	(0.040)
Age of head of household	-0.000**	0.001***	-0.001***	-0.001***	-0.000	0.000***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	-0.004	-0.006***	-0.002	0.008*	-0.007*	0.004	-0.002
(Base = Male)	(0.004)	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)	(0.002)
Years of Education Women has Received	0.002***	-0.002***	-0.014***	-0.015***	-0.002***	0.013***	-0.005***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rural	0.045***	0.012***	0.031***	0.036***	0.007**	-0.021***	0.010***
(Base=urban)	(0.003)	(0.002)	(0.004)	(0.004)	(0.003)	(0.004)	(0.002)
Household Size	-0.002***	-0.006***	-0.001**	-0.001	-0.002***	0.001*	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Religion of the HH (Muslim)	-0.058***	-0.004*	-0.011***	0.001	0.001	-0.058***	-0.059***
(Base= Hindu)	(0.004)	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)	(0.002)
Religion of the HH (Christian)	-0.059***	0.004	-0.027	-0.069***	-0.003	0.000	-0.020
	(0.021)	(0.012)	(0.025)	(0.025)	(0.022)	(0.022)	(0.012)
Religion of the HH (Sikh)	-0.044	-0.019	-0.131***	-0.160***	-0.056*	0.126***	-0.022
	(0.032)	(0.017)	(0.036)	(0.037)	(0.031)	(0.032)	(0.018)
Religion of the HH (Others)	-0.020	0.004	0.043**	-0.006	0.018	0.048***	-0.041***
	(0.016)	(0.009)	(0.018)	(0.019)	(0.016)	(0.016)	(0.009)
Caste of the household(Scheduled Caste)	0.000	0.003*	0.043***	0.055***	0.009***	-0.014***	-0.005**
(Base= General Caste)	(0.003)	(0.002)	(0.004)	(0.004)	(0.003)	(0.003)	(0.002)
Caste of the household(Scheduled Tribe)	-0.042***	0.006***	0.029***	0.027***	0.028***	-0.027***	0.006**
	(0.004)	(0.002)	(0.005)	(0.005)	(0.004)	(0.004)	(0.002)
Constant	0.351***	0.062***	0.384***	0.628***	0.106**	0.533***	0.049**
	(0.038)	(0.021)	(0.044)	(0.049)	(0.043)	(0.038)	(0.022)

Table 4. 18(cont'd)

Observations	140,417	137,829	125,390	122,249	121,529	140,417	140,417
R-squared	0.185	0.014	0.052	0.063	0.022	0.150	0.095

Note: * *p*<0.1; ** *p*<0.05; *** *p*<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

Table 4. 19: GOVERNMENT PROVISIONS - PARENT STATE AS COMPARISON AND NEWLY FORMED STATES AS TREATMENT

VARIABLES	(1) Tetanus Shot	(2) Polio Vaccine	(3) Measles Vaccine	(4) BCG Vaccine	(5) Iron Tablets	(6) Vitamin A tablets	(7) DPT Vaccine
Districts in New states X Post	0.029***	0.091***	0.020**	-0.019**	0.032***	0.028***	0.008
	(0.010)	(0.010)	(0.010)	(0.008)	(0.010)	(0.010)	(0.009)
post	0.090***	0.256***	0.403***	0.418***	0.091***	0.448***	0.336***
	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)
treatment	-0.30***	-0.26***	-0.29***	-0.28***	-0.30***	-0.44***	-0.161**
	(0.073)	(0.070)	(0.071)	(0.061)	(0.072)	(0.071)	(0.065)
Age of head of household	0.001***	0.000***	-0.000	0.000*	0.001***	0.000**	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	0.006	0.006	0.010***	0.025***	-0.000	-0.004	0.025***
(Base = Male)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)
Years of Education Women has Received	0.013***	0.011***	0.009***	0.011***	0.018***	0.009***	0.011***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rural	-0.06***	-0.03***	-0.02***	-0.03***	-0.05***	-0.003	-0.021***
(Base=urban)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)
Household Size	-0.01***	-0.00***	0.000	0.002***	-0.00***	-0.00***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Religion of the HH (Muslim)	-0.03***	-0.04***	-0.08***	-0.07***	-0.04***	-0.06***	-0.081***
(Base= Hindu)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)
Religion of the HH (Christian)	0.028	-0.017	-0.000	0.023	0.027	0.014	0.016
	(0.023)	(0.022)	(0.022)	(0.019)	(0.023)	(0.022)	(0.020)
Religion of the HH (Sikh)	0.108***	0.103***	0.086***	0.070**	0.122***	0.118***	0.074**
	(0.034)	(0.032)	(0.033)	(0.028)	(0.034)	(0.033)	(0.030)
Religion of the HH (Others)	0.018	0.032**	0.022	0.035**	0.024	0.002	0.022
	(0.017)	(0.016)	(0.016)	(0.014)	(0.016)	(0.016)	(0.015)
Caste of the household(Scheduled Caste)	-0.02***	-0.02***	-0.02***	-0.01***	-0.02***	-0.008**	-0.016***
(Base= General Caste)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Caste of the household(Scheduled Tribe)	-0.02***	-0.05***	-0.04***	-0.04***	-0.02***	-0.02***	-0.040***

Table 4. 19 (cont'd)

	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Constant	0.805***	0.225***	0.490***	0.655***	0.641***	0.294***	0.549***
	(0.041)	(0.039)	(0.039)	(0.033)	(0.040)	(0.039)	(0.036)
Observations	140,417	140,417	140,417	140,417	140,417	130,426	140,417
R-squared	0.057	0.110	0.160	0.217	0.103	0.201	0.159

Note: * p<0.1; ** p<0.05; *** p<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

Table 4. 20: MAJOR HEALTH INDICATORS- RDD USING DISTRICTS ON THE NEW STATES AS TREATMENT AND PARENT STATE AS COMPARISON

VARIABLES	(1) Govt Institutional Delivery	(2) Infant Death	(3) Underweight	(4) Stunted	(5) Wasted	(6) Health Card	(7) Compensation for Sterilization
New State Border Dist. # Post	0.061***	-0.016**	-0.026*	-0.06***	-0.06***	0.142***	0.026***
	(0.012)	(0.007)	(0.015)	(0.016)	(0.015)	(0.013)	(0.007)
Post	0.364***	-0.03***	-0.131***	-0.22***	-0.03***	0.236***	0.115***
	(0.007)	(0.004)	(0.009)	(0.009)	(0.008)	(0.008)	(0.004)
Treatment RDD	-0.013	-0.006	-0.145***	-0.20***	-0.07***	-0.07***	-0.075***
	(0.023)	(0.012)	(0.027)	(0.029)	(0.025)	(0.024)	(0.014)
Age of head of household	-0.000	0.000***	-0.001***	-0.00***	-0.000	0.000	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	-0.021***	-0.003	-0.013	-0.001	-0.008	-0.016**	0.004
(Base = Male)	(0.007)	(0.004)	(0.008)	(0.008)	(0.007)	(0.007)	(0.004)
Years of Education Women has Received	0.003***	-0.00***	-0.015***	-0.02***	-0.00***	0.01***	-0.004***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
Rural	0.031***	0.009**	0.030***	0.026***	0.010	-0.013*	-0.007*
(Base=urban)	(0.006)	(0.003)	(0.007)	(0.007)	(0.007)	(0.007)	(0.004)
Household Size	-0.003***	-0.00***	-0.001	-0.001	-0.001	0.001	0.003***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
Religion of the HH (Muslim)	-0.080***	-0.02***	-0.021***	-0.016**	0.001	-0.07***	-0.076***
(Base= Hindu)	(0.007)	(0.004)	(0.008)	(0.008)	(0.007)	(0.007)	(0.004)
Religion of the HH (Christian)	-0.079**	0.011	-0.037	-0.036	-0.025	-0.053	-0.029
	(0.032)	(0.017)	(0.038)	(0.038)	(0.034)	(0.033)	(0.019)
Religion of the HH (Sikh)	-0.022	-0.002	-0.129**	-0.22***	-0.011	0.116**	0.000
	(0.047)	(0.025)	(0.055)	(0.054)	(0.048)	(0.048)	(0.028)
Religion of the HH (Others)	-0.082***	0.030*	0.064*	-0.073*	0.080**	0.071**	-0.026
	(0.030)	(0.016)	(0.037)	(0.037)	(0.033)	(0.031)	(0.018)
Caste of the household(Scheduled Caste)	-0.014**	0.005	0.053***	0.057***	0.007	-0.04***	-0.014***
(Base= General Caste)	(0.006)	(0.003)	(0.007)	(0.007)	(0.007)	(0.006)	(0.004)
Caste of the household(Scheduled Tribe)	-0.040***	0.004	0.022**	0.011	0.022***	-0.011	-0.016***
	(0.008)	(0.004)	(0.009)	(0.009)	(0.008)	(0.008)	(0.005)

Table 4. 20 (cont'd)

Constant	0.138***	0.103***	0.700***	0.781***	0.331***	0.313***	0.109***
	(0.021)	(0.011)	(0.024)	(0.024)	(0.021)	(0.021)	(0.012)
Observations	37,855	37,262	34,058	33,540	33,355	37,855	37,855
R-squared	0.151	0.012	0.054	0.073	0.016	0.144	0.085

Note: * p<0.1; ** p<0.05; *** p<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

Table 4. 21: GOVERNMENT PROVISIONS- RDD USING DISTRICTS ON THE NEW STATES AS TREATMENT AND PARENT STATE AS COMPARISON

VARIABLES	(1) Tetanus Shot	(2) Polio Vaccine	(3) Measles Vaccine	(4) BCG Vaccine	(5) Iron Tablets	(6) Vitamin A tablets	(7) DPT Vaccine
New State Border Dist. # Post	-0.019	0.035***	0.034***	0.067***	-0.018	0.043***	0.031***
	(0.013)	(0.013)	(0.013)	(0.010)	(0.013)	(0.013)	(0.011)
post	0.160***	0.305***	0.468***	0.504***	0.142***	0.454***	0.411***
	(0.008)	(0.008)	(0.008)	(0.006)	(0.008)	(0.008)	(0.007)
Treatment_RDD	-0.078***	-0.059**	0.017	0.078***	0.181***	0.061**	0.024
	(0.025)	(0.024)	(0.024)	(0.020)	(0.025)	(0.025)	(0.021)
Age of head of household	0.002***	0.000	-0.000	0.000*	0.001***	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	-0.006	-0.006	0.001	0.013**	-0.007	-0.010	0.015**
(Base = Male)	(0.008)	(0.008)	(0.007)	(0.006)	(0.008)	(0.008)	(0.007)
Years of Education Women has Received	0.012***	0.011***	0.008***	0.011***	0.018***	0.009***	0.011***
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)
Rural	-0.062***	-0.025***	-0.015**	-0.024***	-0.050***	0.006	-0.020***
(Base=urban)	(0.007)	(0.007)	(0.007)	(0.005)	(0.007)	(0.007)	(0.006)
Household Size	-0.009***	-0.000	0.001	0.002***	-0.008***	-0.001	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Religion of the HH (Muslim)	-0.023***	-0.066***	-0.086***	-0.065***	-0.056***	-0.082***	-0.081***
(Base= Hindu)	(0.007)	(0.007)	(0.007)	(0.006)	(0.007)	(0.007)	(0.006)
Religion of the HH (Christian)	0.020	-0.010	-0.013	0.044*	0.036	0.031	0.011
	(0.034)	(0.033)	(0.033)	(0.027)	(0.034)	(0.034)	(0.029)
Religion of the HH (Sikh)	0.135***	0.132***	0.125***	0.109***	0.149***	0.161***	0.097**
	(0.050)	(0.049)	(0.048)	(0.039)	(0.050)	(0.048)	(0.043)

Table 4. 21 (cont'd)

Religion of the HH (Others)	0.078**	0.027	0.061**	0.079***	0.060*	0.073**	0.072***
	(0.032)	(0.031)	(0.031)	(0.025)	(0.032)	(0.031)	(0.027)
Caste of the household(Scheduled Caste)	-0.046***	-0.022***	-0.032***	-0.018***	-0.025***	-0.024***	-0.033***
(Base= General Caste)	(0.007)	(0.006)	(0.006)	(0.005)	(0.007)	(0.007)	(0.006)
Caste of the household(Scheduled Tribe)	0.004	-0.050***	-0.017**	-0.014**	0.011	-0.012	-0.011
	(0.008)	(0.008)	(0.008)	(0.006)	(0.008)	(0.008)	(0.007)
Constant	0.562***	0.200***	0.211***	0.325***	0.251***	0.140***	0.393***
	(0.022)	(0.021)	(0.021)	(0.017)	(0.022)	(0.021)	(0.019)
Observations	37,855	37,855	37,855	37,855	37,855	35,353	37,855
R-squared	0.065	0.117	0.172	0.264	0.099	0.197	0.186

Note: * *p*<0.1; ** *p*<0.05; *** *p*<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

Table 4. 22: MAJOR HEALTH INDICATORS (CHILD) ADJACENT STATES AS COMPARISON AND BOTH PARENT AND NEW STATES AS TWO TREATMENTS

VARIABLES	(1) Govt Institutional Delivery	(2) Infant Death	(3) Underweight	(4) Stunted	(5) Wasted	(6) Health Card	(7) Compensation for Sterilization
New States X Post	0.097***	-0.02***	-0.041***	-0.029**	-0.002	0.168***	0.032***
	(0.010)	(0.005)	(0.012)	(0.013)	(0.012)	(0.010)	(0.006)
Parent State X Post	0.092***	-0.004	-0.041***	-0.010	-0.07***	0.094***	-0.064***
	(0.005)	(0.002)	(0.006)	(0.006)	(0.006)	(0.005)	(0.003)
Post	0.345***	-0.03***	-0.071***	-0.13***	0.033***	0.208***	0.192***
	(0.004)	(0.002)	(0.004)	(0.005)	(0.004)	(0.003)	(0.002)
New States	-0.107**	0.017	0.119**	0.014	0.119**	-0.14***	-0.042
	(0.051)	(0.026)	(0.057)	(0.066)	(0.058)	(0.049)	(0.032)
Parent States	-0.151***	0.018	0.010	0.035	0.022	-0.20***	0.001
	(0.023)	(0.011)	(0.026)	(0.028)	(0.024)	(0.022)	(0.014)
Age of head of household	-0.000***	0.000***	-0.001***	-0.00***	-0.000	0.000***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	0.012***	-0.003*	-0.001	0.005	-0.005*	0.006*	-0.005**
(Base = Male)	(0.003)	(0.002)	(0.004)	(0.004)	(0.003)	(0.003)	(0.002)
Years of Education Women has Received	-0.001***	-0.00***	-0.014***	-0.02***	-0.00***	0.012***	-0.007***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rural	0.022***	0.009***	0.029***	0.030***	0.009***	-0.021***	0.025***
(Base=urban)	(0.003)	(0.001)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)
Household Size	-0.001**	-0.01***	-0.001***	-0.000	-0.00***	0.001*	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Religion of the HH (Muslim)	-0.051***	-0.001	-0.006*	0.005	-0.000	-0.05***	-0.056***
(Base= Hindu)	(0.003)	(0.001)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)
Religion of the HH (Christian)	0.006	-0.009*	-0.002	-0.04***	0.038***	0.000	0.015**
	(0.011)	(0.005)	(0.012)	(0.013)	(0.011)	(0.010)	(0.007)
Religion of the HH (Sikh)	-0.027	-0.010	-0.054***	-0.09***	-0.025	0.082***	-0.011

Table 4. 22 (cont'd)

	(0.018)	(0.009)	(0.020)	(0.020)	(0.018)	(0.017)	(0.011)
Religion of the HH (Others)	0.019**	-0.000	0.013	0.032***	-0.003	0.017**	-0.002
	(0.008)	(0.004)	(0.009)	(0.009)	(0.008)	(0.008)	(0.005)
Caste of the household(Scheduled Caste)	0.032***	0.003**	0.035***	0.046***	0.012***	-0.01***	0.005***
(Base= General Caste)	(0.003)	(0.001)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)
Caste of the household(Scheduled Tribe)	0.000	0.008***	0.045***	0.038***	0.029***	-0.03***	0.002
	(0.003)	(0.002)	(0.004)	(0.004)	(0.003)	(0.003)	(0.002)
Constant	0.355***	0.054***	0.453***	0.643***	0.136***	0.646***	0.051**
	(0.033)	(0.016)	(0.037)	(0.039)	(0.035)	(0.032)	(0.021)
Observations	228,754	225,019	203,899	195,895	194,693	228,754	228,754
R-squared	0.173	0.017	0.062	0.078	0.023	0.165	0.101

Note: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

Table 4. 23: GOVERNMENT PROVISIONS (CHILD) - ADJACENT STATES AS COMPARISON AND BOTH PARENT AND NEW STATES AS TWO TREATMENTS

VARIABLES	(1) Tetanus Shot	(2) Polio Vaccine	(3) Measles Vaccine	(4) BCG Vaccine	(5) Iron Tablets	(6) Vitamin A tablets	(7) DPT Vaccine
New States X Post	0.194***	0.072***	0.149***	0.196***	0.195***	-0.016	0.197***
	(0.010)	(0.010)	(0.010)	(0.008)	(0.010)	(0.010)	(0.009)
Parent State X Post	0.165***	-0.022***	0.128***	0.217***	0.160***	0.011**	0.190***
	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)
Post	-0.076***	0.279***	0.276***	0.205***	-0.069***	0.437***	0.149***
	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)
New States	-0.148***	0.013	-0.164***	-0.170***	-0.257***	-0.124**	-0.175***
	(0.052)	(0.052)	(0.052)	(0.043)	(0.053)	(0.052)	(0.046)
Parent States	-0.212***	-0.027	-0.090***	-0.197***	-0.248***	-0.107***	-0.188***
	(0.024)	(0.024)	(0.024)	(0.019)	(0.024)	(0.023)	(0.021)
Age of head of household	0.001***	0.000***	-0.000***	-0.000	0.001***	0.000*	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	0.001	0.000	0.004	0.015***	-0.002	-0.004	0.013***
(Base = Male)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Years of Education Women has Received	0.013***	0.010***	0.008***	0.010***	0.017***	0.008***	0.010***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rural	-0.041***	-0.018***	-0.019***	-0.025***	-0.033***	-0.001	-0.020***
(Base=urban)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)
Household Size	-0.009***	-0.002***	-0.001**	0.002***	-0.007***	-0.003***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Religion of the HH (Muslim)	-0.031***	-0.039***	-0.077***	-0.067***	-0.046***	-0.051***	-0.073***
(Base= Hindu)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Religion of the HH (Christian)	0.016	-0.032***	-0.015	0.002	0.025**	-0.025**	0.012
	(0.011)	(0.011)	(0.011)	(0.009)	(0.011)	(0.011)	(0.010)
Religion of the HH (Sikh)	0.085***	0.051***	0.058***	0.060***	0.045**	0.083***	0.068***

Table 4. 23 (cont'd)

	(0.018)	(0.018)	(0.018)	(0.015)	(0.019)	(0.018)	(0.016)
Religion of the HH (Others)	0.013	0.002	0.010	0.017***	0.018**	-0.004	0.002
	(0.008)	(0.008)	(0.008)	(0.007)	(0.008)	(0.008)	(0.007)
Caste of the household(Scheduled Caste)	-0.024***	-0.015***	-0.020***	-0.013***	-0.008***	-0.005*	-0.018***
(Base= General Caste)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)
Caste of the household(Scheduled Tribe)	-0.017***	-0.058***	-0.039***	-0.028***	-0.011***	-0.013***	-0.036***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Constant	0.914***	0.217***	0.515***	0.766***	0.750***	0.304***	0.689***
	(0.034)	(0.034)	(0.034)	(0.028)	(0.034)	(0.033)	(0.030)
Observations	228,754	228,754	228,754	228,754	228,754	214,199	228,754
R-squared	0.074	0.128	0.147	0.190	0.137	0.225	0.144

Note: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

APPENDIX D: TABLE- STATEWISE DETAILED RESULTS

Table 4. 24: SELECTED DEVELOPMENTAL INDICATORS- BIHAR AS COMPARISON AND JHARKHAND AS TREATMENT

VARIABLES	(1) Electricity	(2) Piped Drinking Water	(3) Concrete Housing	(4) Toilet	(5) Clean Cooking Fuel	(6) Television	(7) Internet	(8) Refrigerator	(9) Motorbike
Districts in Jharkhand	0.11***	0.04***	0.03***	0.11***	0.03***	0.03***	-0.01	0.03***	0.05***
	(0.009)	(0.004)	(0.008)	(0.008)	(0.007)	(0.008)	(0.005)	(0.005)	(0.008)
Post	0.42***	0.02***	0.10***	0.16***	0.10***	0.12***	0.06***	0.00	0.11***
	(0.004)	(0.002)	(0.004)	(0.004)	(0.003)	(0.004)	(0.002)	(0.002)	(0.004)
Age of head of household	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	0.02***	0.00	0.04***	0.04***	0.03***	0.03***	0.01***	0.02***	0.01*
(Base = Male)	(0.004)	(0.002)	(0.004)	(0.004)	(0.003)	(0.004)	(0.002)	(0.002)	(0.004)
Education of the Household head	0.01***	0.00***	0.02***	0.02***	0.02***	0.02***	0.01***	0.01***	0.02***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household Size	0.01***	-0.00	0.00***	0.00***	-0.01***	0.01***	0.00***	0.00***	0.01***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
Rural	-0.25***	-0.10***	-0.40***	-0.43***	-0.40***	-0.34***	-0.10***	-0.18***	-0.12***
(Base=urban)	(0.005)	(0.002)	(0.004)	(0.004)	(0.003)	(0.004)	(0.002)	(0.003)	(0.004)
Religion of the HH (Muslim)	0.01***	0.00*	0.01**	0.09***	-0.01***	-0.05***	-0.01***	0.01***	-0.02***
(Base= Hindu)	(0.005)	(0.002)	(0.004)	(0.004)	(0.003)	(0.004)	(0.002)	(0.003)	(0.004)
Religion of the HH (Christian)	-0.01	-0.02***	-0.00	0.05***	0.02	-0.01	0.00	0.01	0.04***
	(0.017)	(0.007)	(0.015)	(0.015)	(0.012)	(0.015)	(0.008)	(0.010)	(0.014)
Religion of the HH (Sikh)	0.05	0.12***	0.14***	0.14***	0.19***	0.08	-0.02	0.17***	0.15***
	(0.058)	(0.023)	(0.050)	(0.052)	(0.041)	(0.052)	(0.028)	(0.033)	(0.048)
Religion of the HH (Others)	-0.01	-0.04***	-0.11***	-0.05***	-0.06***	-0.09***	-0.02***	-0.04***	-0.05***
	(0.013)	(0.005)	(0.011)	(0.011)	(0.009)	(0.011)	(0.006)	(0.007)	(0.011)
Caste of the household(Scheduled Caste)	-0.05***	-0.00***	-0.08***	-0.09***	-0.05***	-0.05***	-0.02***	-0.01***	-0.05***
(Base= General Caste)	(0.004)	(0.002)	(0.004)	(0.004)	(0.003)	(0.004)	(0.002)	(0.002)	(0.003)

Table 4.24 (cont'd)

Caste of the household(Scheduled Tribe)	-0.07***	-0.02***	-0.10***	-0.07***	-0.05***	-0.07***	-0.01***	-0.03***	-0.06***
	(0.006)	(0.002)	(0.005)	(0.006)	(0.004)	(0.006)	(0.003)	(0.004)	(0.005)
Constant	0.24***	0.08***	0.34***	0.28***	0.33***	0.22***	0.03***	0.11***	-0.06***
	(0.008)	(0.003)	(0.007)	(0.007)	(0.006)	(0.007)	(0.004)	(0.005)	(0.007)
Observations	73,156	73,156	73,156	73,156	72,871	73,156	73,156	73,156	73,156
R-squared	0.310	0.106	0.316	0.326	0.331	0.279	0.089	0.166	0.165

Note: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village

Table 4. 25: SELECTED DEVELOPMENTAL INDICATORS- MADHYA PRADESH AS COMPARISON AND CHHATTISGARH AS TREATMENT

VARIABLES	(1) Electricity	(2) Piped Drinking Water	(3) Concrete Housing	(4) Toilet	(5) Clean Cooking Fuel	(6) Television	(7) Internet	(8) Refrigerator	(9) Motorbike
Districts in Chhattisgarh	0.19***	0.09***	0.02**	0.05***	0.02***	0.12***	0.00	0.00	-0.02**
	(0.006)	(0.005)	(0.007)	(0.007)	(0.006)	(0.008)	(0.005)	(0.006)	(0.008)
Post	0.21***	0.13***	0.17***	0.16***	0.11***	0.29***	0.12***	0.11***	0.28***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
Age of head of household	-0.00*	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	0.01	-0.00	0.00	0.01***	0.01***	-0.01*	0.00	0.00	-0.06***
(Base = Male)	(0.004)	(0.003)	(0.005)	(0.005)	(0.004)	(0.005)	(0.003)	(0.004)	(0.005)
Education of the Household head	0.01***	0.00***	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***	0.02***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household Size	0.01***	-0.00***	0.00***	0.01***	-0.00***	0.03***	0.01***	0.01***	0.03***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
Rural	-0.09***	-0.18***	-0.39***	-0.44***	-0.49***	-0.29***	-0.13***	-0.25***	-0.15***
(Base=urban)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.002)	(0.003)	(0.004)
Religion of the HH (Muslim)	0.02***	-0.02***	0.01	0.10***	-0.03***	-0.01*	-0.06***	0.01*	-0.07***
(Base= Hindu)	(0.005)	(0.005)	(0.006)	(0.006)	(0.005)	(0.007)	(0.005)	(0.005)	(0.007)
Religion of the HH (Christian)	-0.04***	0.02*	0.08***	0.12***	0.08***	0.05***	0.06***	0.08***	0.07***
	(0.013)	(0.011)	(0.016)	(0.016)	(0.013)	(0.018)	(0.012)	(0.013)	(0.017)
Religion of the HH (Sikh)	0.04	0.13***	0.15***	0.15***	0.19***	0.16***	0.12***	0.26***	0.21***
	(0.024)	(0.021)	(0.029)	(0.028)	(0.024)	(0.032)	(0.021)	(0.024)	(0.032)
Religion of the HH (Others)	0.06***	0.03***	0.11***	0.15***	0.20***	0.13***	0.08***	0.17***	0.14***
	(0.012)	(0.011)	(0.015)	(0.014)	(0.012)	(0.016)	(0.011)	(0.012)	(0.016)
Caste of the household(Scheduled Caste)	-0.03***	-0.02***	-0.07***	-0.10***	-0.06***	-0.07***	-0.03***	-0.05***	-0.10***
(Base= General Caste)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
Caste of the household(Scheduled Tribe)	-0.06***	-0.05***	-0.16***	-0.16***	-0.10***	-0.19***	-0.05***	-0.07***	-0.14***

Table 4. 25 (cont'd)

	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
Constant	0.66***	0.10***	0.36***	0.38***	0.45***	0.25***	-0.01**	0.03***	-0.04***
	(0.006)	(0.005)	(0.007)	(0.007)	(0.006)	(0.007)	(0.005)	(0.006)	(0.007)
Observations	83,314	83,314	83,314	83,314	83,295	83,314	83,314	83,314	83,314
R-squared	0.203	0.193	0.351	0.419	0.487	0.321	0.168	0.261	0.235

Note: * p<0.1; ** p<0.05; *** p<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village

Table 4. 26: SELECTED DEVELOPMENTAL INDICATORS- UTTAR PRADESH AS COMPARISON AND UTTARAKHAND AS TREATMENT

VARIABLES	(1) Electricity	(2) Piped Drinking Water	(3) Concrete Housing	(4) Toilet	(5) Clean Cooking Fuel	(6) Television	(7) Internet	(8) Refrigerator	(9) Motorbike
Districts in Uttarakhand	0.07***	0.24***	0.08***	0.24***	0.01	0.16***	0.19***	0.10***	-0.03**
	(0.013)	(0.008)	(0.012)	(0.012)	(0.011)	(0.014)	(0.008)	(0.011)	(0.013)
Post	0.36***	0.07***	0.08***	0.18***	0.16***	0.22***	0.07***	0.13***	0.26***
	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)
Age of head of household	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	0.04***	0.00**	0.03***	0.02***	0.03***	0.03***	0.01***	0.02***	-0.01***
(Base = Male)	(0.004)	(0.002)	(0.004)	(0.003)	(0.003)	(0.004)	(0.002)	(0.003)	(0.004)
Education of the Household head	0.01***	0.00***	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household Size	0.01***	-0.00***	0.00***	0.00***	-0.01***	0.02***	0.00***	0.01***	0.02***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rural	-0.27***	-0.20***	-0.46***	-0.46***	-0.50***	-0.35***	-0.09***	-0.31***	-0.12***
(Base=urban)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)
Religion of the HH (Muslim)	0.05***	0.01**	0.01***	0.17***	-0.01**	-0.11***	-0.03***	0.01***	-0.06***
(Base= Hindu)	(0.004)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.002)	(0.003)	(0.004)
Religion of the HH (Christian)	0.08**	-0.05**	0.17***	0.08**	0.08**	0.07*	0.02	0.16***	0.10**
	(0.039)	(0.024)	(0.037)	(0.036)	(0.035)	(0.042)	(0.023)	(0.034)	(0.041)
Religion of the HH (Sikh)	0.14***	0.03***	0.14***	0.08***	0.13***	0.17***	0.06***	0.25***	0.17***
	(0.019)	(0.011)	(0.018)	(0.017)	(0.017)	(0.020)	(0.011)	(0.017)	(0.020)
Religion of the HH (Others)	0.04	0.01	0.09***	0.09***	0.18***	0.14***	-0.00	0.19***	0.14***
	(0.027)	(0.017)	(0.026)	(0.025)	(0.024)	(0.029)	(0.016)	(0.024)	(0.028)
Caste of the household(Scheduled Caste)	-0.06***	-0.02***	-0.08***	-0.10***	-0.08***	-0.08***	-0.04***	-0.08***	-0.12***
(Base= General Caste)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)

Table 4. 26 (cont'd)

Caste of the household(Scheduled Tribe)	-0.12***	0.01**	-0.09***	-0.10***	-0.05***	-0.09***	0.00	-0.03***	-0.05***
	(0.007)	(0.004)	(0.006)	(0.006)	(0.006)	(0.007)	(0.004)	(0.006)	(0.007)
Constant	0.40***	0.14***	0.46***	0.40***	0.45***	0.25***	-0.02***	0.10***	-0.12***
	(0.006)	(0.004)	(0.006)	(0.006)	(0.005)	(0.006)	(0.004)	(0.005)	(0.006)
Observations	108,363	108,363	108,363	108,363	108,350	108,363	108,363	108,361	108,356
R-squared	0.347	0.221	0.369	0.467	0.431	0.310	0.144	0.313	0.202

Note: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village

Table 4. 27: SELECTED DEVELOPMENTAL INDICATORS- BORDERING DISTRICTS IN BIHAR AS COMPARISON AND BORDERING DISTRICTS IN JHARKHAND AS TREATMENT

VARIABLES	(1) Electricity	(2) Piped Drinking Water	(3) Concrete Housing	(4) Toilet	(5) Clean Cooking Fuel	(6) Television	(7) Internet	(8) Refrigerator	(9) Motorbike
Bordering Districts in Jharkhand	0.13***	0.01**	-0.00	0.09***	0.05***	-0.01	-0.02***	-0.00	0.03***
	(0.012)	(0.004)	(0.011)	(0.011)	(0.008)	(0.011)	(0.006)	(0.007)	(0.010)
Post	0.42***	0.02***	0.12***	0.16***	0.11***	0.15***	0.07***	0.02***	0.12***
	(0.007)	(0.003)	(0.007)	(0.007)	(0.005)	(0.007)	(0.004)	(0.004)	(0.006)
Age of head of household	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	0.01*	-0.00	0.04***	0.04***	0.03***	0.01	0.01***	0.01***	-0.01
(Base = Male)	(0.007)	(0.002)	(0.006)	(0.006)	(0.005)	(0.007)	(0.003)	(0.004)	(0.006)
Education of the Household head	0.01***	0.00***	0.02***	0.02***	0.01***	0.02***	0.00***	0.01***	0.01***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household Size	0.01***	-0.00***	0.00***	0.00**	-0.01***	0.01***	0.00***	0.00***	0.02***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Rural	-0.29***	-0.10***	-0.42***	-0.47***	-0.38***	-0.37***	-0.08***	-0.17***	-0.11***
(Base=urban)	(0.007)	(0.002)	(0.006)	(0.006)	(0.005)	(0.006)	(0.003)	(0.004)	(0.006)
Religion of the HH (Muslim)	0.04***	-0.00	0.03***	0.11***	-0.01	-0.05***	-0.00	0.01*	-0.01**
(Base= Hindu)	(0.007)	(0.002)	(0.007)	(0.007)	(0.005)	(0.007)	(0.003)	(0.004)	(0.006)
Religion of the HH (Christian)	-0.02	-0.01	-0.00	0.08***	0.02	-0.01	-0.00	0.01	0.08***
	(0.025)	(0.008)	(0.023)	(0.022)	(0.017)	(0.024)	(0.012)	(0.015)	(0.022)
Religion of the HH (Sikh)	0.23**	0.04	0.17	0.25**	0.19**	0.20*	-0.03	0.31***	0.25***
	(0.109)	(0.037)	(0.103)	(0.099)	(0.077)	(0.106)	(0.052)	(0.067)	(0.097)
Religion of the HH (Others)	-0.08***	-0.02**	-0.08***	-0.04*	-0.05***	-0.07***	-0.02*	-0.03*	-0.02
	(0.023)	(0.008)	(0.021)	(0.020)	(0.016)	(0.022)	(0.011)	(0.014)	(0.020)
Caste of the household(Scheduled Caste)	-0.05***	-0.00**	-0.10***	-0.10***	-0.05***	-0.08***	-0.02***	-0.02***	-0.07***
(Base= General Caste)	(0.006)	(0.002)	(0.006)	(0.006)	(0.004)	(0.006)	(0.003)	(0.004)	(0.005)
Caste of the household(Scheduled Tribe)	-0.11***	-0.00	-0.12***	-0.07***	-0.05***	-0.09***	-0.01***	-0.02***	-0.08***

Table 4. 27 (cont'd)

	(0.009)	(0.003)	(0.008)	(0.008)	(0.006)	(0.008)	(0.004)	(0.005)	(0.008)
Constant	0.30***	0.08***	0.36***	0.32***	0.30***	0.25***	0.01*	0.10***	-0.05***
	(0.012)	(0.004)	(0.011)	(0.011)	(0.009)	(0.012)	(0.006)	(0.007)	(0.011)
Observations	31,505	31,505	31,505	31,505	31,465	31,505	31,505	31,505	31,505
R-squared	0.312	0.099	0.277	0.310	0.282	0.232	0.072	0.110	0.135

Note: * *p*<0.1; ** *p*<0.05; *** *p*<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village

Table 4. 28: SELECTED DEVELOPMENTAL INDICATORS- BORDERING DISTRICTS IN MADHYA PRADESH AS COMPARISON AND BORDERING DISTRICTS IN CHHATTISGARH AS TREATMENT

VARIABLES	(1) Electricity	(2) Piped Drinking Water	(3) Concrete Housing	(4) Toilet	(5) Clean Cooking Fuel	(6) Television	(7) Internet	(8) Refrigerator	(9) Motorbike
Bordering Districts in Chhattisgarh	0.08***	0.02***	0.13***	0.17***	0.03***	0.20***	0.07***	0.05***	0.12***
	(0.012)	(0.007)	(0.012)	(0.013)	(0.010)	(0.014)	(0.008)	(0.010)	(0.013)
Post	0.38***	0.02***	0.05***	0.08***	0.04***	0.24***	0.03***	0.05***	0.15***
	(0.010)	(0.006)	(0.009)	(0.010)	(0.008)	(0.011)	(0.007)	(0.007)	(0.010)
Age of head of household	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	0.01	-0.01**	0.01	0.01	0.02***	0.01	0.01*	0.01**	-0.02**
(Base = Male)	(0.009)	(0.005)	(0.008)	(0.009)	(0.007)	(0.010)	(0.006)	(0.007)	(0.009)
Education of the Household head	0.01***	0.00***	0.01***	0.02***	0.01***	0.02***	0.01***	0.01***	0.02***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
Household Size	0.01***	-0.00***	0.00***	0.00***	-0.00***	0.03***	0.00***	0.01***	0.02***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Rural	-0.10***	-0.21***	-0.44***	-0.42***	-0.45***	-0.29***	-0.14***	-0.27***	-0.21***
(Base=urban)	(0.007)	(0.004)	(0.007)	(0.008)	(0.006)	(0.009)	(0.005)	(0.006)	(0.008)
Religion of the HH (Muslim)	0.07***	-0.02	0.09***	0.14***	0.06***	0.06***	-0.02*	0.02	0.01
(Base= Hindu)	(0.019)	(0.011)	(0.018)	(0.019)	(0.015)	(0.021)	(0.013)	(0.014)	(0.020)
Religion of the HH (Christian)	0.07**	0.02	0.08***	0.11***	0.08***	0.02	0.05**	0.04	0.05
	(0.030)	(0.018)	(0.029)	(0.031)	(0.024)	(0.034)	(0.021)	(0.023)	(0.033)
Religion of the HH (Sikh)	0.19**	0.15***	0.24***	0.33***	0.30***	0.40***	0.08	0.35***	0.28***
	(0.084)	(0.050)	(0.080)	(0.086)	(0.066)	(0.096)	(0.057)	(0.064)	(0.091)

Table 4. 28 (cont'd)

Religion of the HH (Others)	0.07**	-0.03	0.02	0.00	0.06**	0.03	0.07***	0.00	0.01
	(0.034)	(0.020)	(0.032)	(0.034)	(0.026)	(0.038)	(0.023)	(0.026)	(0.036)
Caste of the household(Scheduled Caste)	-0.03***	-0.02***	-0.07***	-0.05***	-0.05***	-0.04***	-0.01**	-0.03***	-0.05***
(Base= General Caste)	(0.008)	(0.004)	(0.007)	(0.008)	(0.006)	(0.009)	(0.005)	(0.006)	(0.008)
Caste of the household(Scheduled Tribe)	-0.08***	-0.00	-0.11***	-0.09***	-0.06***	-0.14***	-0.02***	-0.04***	-0.09***
	(0.006)	(0.004)	(0.006)	(0.007)	(0.005)	(0.007)	(0.004)	(0.005)	(0.007)
Constant	0.43***	0.18***	0.36***	0.28***	0.38***	0.18***	0.04***	0.12***	-0.00
	(0.014)	(0.008)	(0.014)	(0.015)	(0.011)	(0.016)	(0.010)	(0.011)	(0.015)
Observations	17,431	17,431	17,431	17,431	17,430	17,431	17,431	17,431	17,431
R-squared	0.303	0.170	0.368	0.349	0.400	0.361	0.144	0.251	0.247

Note: * *p*<0.1; ** *p*<0.05; *** *p*<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village

Table 4. 29: SELECTED DEVELOPMENTAL INDICATORS- BORDERING DISTRICTS IN UTTAR PRADESH AS COMPARISON AND BORDERING DISTRICTS IN UTTARAKHAND AS TREATMENT

VARIABLES	(1) Electricity	(2) Piped Drinking Water	(3) Concrete Housing	(4) Toilet	(5) Clean Cooking Fuel	(6) Television	(7) Internet	(8) Refrigerator	(9) Motorbike
Bordering Districts in Uttarakhand	-0.01	0.26***	0.06***	-0.02	0.06***	0.07***	0.28***	0.06***	-0.01
	(0.014)	(0.011)	(0.016)	(0.014)	(0.015)	(0.017)	(0.009)	(0.016)	(0.017)
Post	0.34***	0.09***	0.21***	0.35***	0.21***	0.23***	0.02***	0.20***	0.29***
	(0.007)	(0.006)	(0.008)	(0.007)	(0.008)	(0.009)	(0.004)	(0.008)	(0.009)
Age of head of household	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	0.03***	0.03***	0.03***	0.05***	0.05***	0.03***	0.00	0.04***	-0.01
(Base = Male)	(0.008)	(0.006)	(0.009)	(0.008)	(0.009)	(0.010)	(0.005)	(0.009)	(0.010)
Education of the Household head	0.01***	0.00***	0.01***	0.01***	0.01***	0.01***	0.00***	0.02***	0.02***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household Size	0.01***	-0.00	0.00*	0.01***	-0.01***	0.02***	0.00**	0.01***	0.02***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Rural	-0.22***	-0.20***	-0.41***	-0.30***	-0.44***	-0.29***	-0.04***	-0.27***	-0.07***
(Base=urban)	(0.006)	(0.004)	(0.006)	(0.006)	(0.006)	(0.007)	(0.003)	(0.006)	(0.007)
Religion of the HH (Muslim)	0.06***	-0.02***	0.01	0.21***	-0.01**	-0.20***	-0.03***	0.02**	-0.05***
(Base= Hindu)	(0.006)	(0.005)	(0.007)	(0.006)	(0.007)	(0.007)	(0.004)	(0.007)	(0.008)
Religion of the HH (Christian)	0.11*	0.07*	0.09	0.10*	0.12**	0.14**	0.10***	0.22***	0.22***
	(0.055)	(0.044)	(0.063)	(0.056)	(0.060)	(0.065)	(0.034)	(0.063)	(0.067)
Religion of the HH (Sikh)	0.14***	0.01	0.16***	0.10***	0.12***	0.16***	0.02	0.27***	0.19***
	(0.022)	(0.017)	(0.025)	(0.022)	(0.023)	(0.026)	(0.013)	(0.025)	(0.027)
Religion of the HH (Others)	0.17***	-0.05*	0.23***	0.23***	0.33***	0.16***	-0.04*	0.18***	0.14***
	(0.040)	(0.032)	(0.046)	(0.041)	(0.042)	(0.047)	(0.024)	(0.045)	(0.049)
Caste of the household(Scheduled Caste)	-0.02***	-0.04***	-0.10***	-0.14***	-0.10***	-0.05***	-0.04***	-0.12***	-0.11***
(Base= General Caste)	(0.007)	(0.005)	(0.008)	(0.007)	(0.007)	(0.008)	(0.004)	(0.008)	(0.008)
Caste of the household(Scheduled Tribe)	-0.01	-0.02**	-0.11***	-0.17***	-0.11***	-0.09***	-0.02***	-0.08***	-0.05***

Table 4. 29 (cont'd)

	(0.013)	(0.011)	(0.015)	(0.014)	(0.014)	(0.016)	(0.008)	(0.015)	(0.016)
Constant	0.47***	0.11***	0.47***	0.37***	0.45***	0.27***	-0.03***	-0.01	-0.16***
	(0.012)	(0.010)	(0.014)	(0.013)	(0.013)	(0.015)	(0.008)	(0.014)	(0.015)
Observations	21,516	21,516	21,516	21,516	21,509	21,516	21,516	21,516	21,515
R-squared	0.297	0.274	0.324	0.384	0.386	0.277	0.252	0.256	0.170

Note: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village

Table 4. 30: SELECTED DEVELOPMENTAL INDICATORS- NEARBY STATES AS COMPARISON AND BOTH BIHAR AND JHARKHAND AS TREATMENTS

VARIABLES	(1) Electricity	(2) Piped Drinking Water	(3) Concrete Housing	(4) Toilet	(5) Clean Cooking Fuel	(6) Television	(7) Internet	(8) Refrigerator	(9) Motorbike
Jharkhand X Post	-0.01	0.01***	0.09***	0.19***	0.05***	0.21***	-0.02***	0.07***	-0.01
	(0.009)	(0.004)	(0.009)	(0.009)	(0.007)	(0.009)	(0.005)	(0.006)	(0.008)
Bihar X Post	-0.12***	-0.02***	-0.12***	-0.10***	-0.03***	-0.25***	-0.01***	-0.09***	-0.05***
	(0.005)	(0.002)	(0.006)	(0.006)	(0.005)	(0.006)	(0.003)	(0.004)	(0.005)
Post	0.55***	0.04***	0.22***	0.26***	0.12***	0.38***	0.07***	0.10***	0.17***
	(0.004)	(0.002)	(0.004)	(0.004)	(0.003)	(0.004)	(0.002)	(0.003)	(0.003)
Age of head of household	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	-0.01**	-0.00	0.02***	0.00	0.01***	-0.00	0.01***	0.01***	-0.02***
(Base = Male)	(0.003)	(0.001)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)
Education of the Household head	0.01***	0.00***	0.01***	0.01***	0.01***	0.01***	0.00***	0.01***	0.01***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household Size	0.01***	-0.00	0.00***	0.00***	-0.01***	0.02***	0.00***	0.00***	0.02***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rural	-0.19***	-0.07***	-0.35***	-0.33***	-0.38***	-0.30***	-0.09***	-0.19***	-0.11***
(Base=urban)	(0.003)	(0.001)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
Religion of the HH (Muslim)	-0.02***	0.00**	-0.04***	0.03***	-0.07***	-0.11***	-0.01***	-0.02***	-0.02***
(Base= Hindu)	(0.003)	(0.001)	(0.003)	(0.003)	(0.003)	(0.004)	(0.002)	(0.002)	(0.003)
Religion of the HH (Christian)	0.00	-0.01	0.01	0.04***	-0.02*	0.01	-0.00	0.01	0.03**
	(0.011)	(0.005)	(0.011)	(0.011)	(0.009)	(0.011)	(0.006)	(0.008)	(0.010)
Religion of the HH (Sikh)	0.07	0.09***	0.12***	0.16***	0.18***	0.07	-0.02	0.19***	0.15***
	(0.044)	(0.020)	(0.046)	(0.045)	(0.037)	(0.047)	(0.024)	(0.032)	(0.041)
Religion of the HH (Others)	0.01	-0.02***	-0.08***	0.01*	-0.06***	-0.09***	-0.02***	-0.02***	-0.01
	(0.008)	(0.004)	(0.008)	(0.008)	(0.007)	(0.009)	(0.004)	(0.006)	(0.008)
Caste of the household(Scheduled Caste)	-0.04***	-0.01***	-0.11***	-0.09***	-0.07***	-0.06***	-0.02***	-0.04***	-0.07***
(Base= General Caste)	(0.003)	(0.001)	(0.003)	(0.003)	(0.002)	(0.003)	(0.001)	(0.002)	(0.002)

Table 4. 30 (cont'd)

Caste of the household(Scheduled Tribe)	-0.11***	-0.02***	-0.16***	-0.17***	-0.09***	-0.14***	-0.02***	-0.06***	-0.10***
	(0.004)	(0.002)	(0.004)	(0.004)	(0.003)	(0.004)	(0.002)	(0.003)	(0.004)
Constant	0.32***	0.04***	0.34***	0.35***	0.32***	0.22***	0.01***	0.08***	-0.05***
	(0.005)	(0.002)	(0.006)	(0.006)	(0.005)	(0.006)	(0.003)	(0.004)	(0.005)
Observations	133,064	133,064	133,064	133,064	131,563	133,064	133,064	133,063	133,060
R-squared	0.390	0.086	0.313	0.392	0.338	0.322	0.087	0.210	0.154

Note: * *p*<0.1; ** *p*<0.05; *** *p*<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village

Table 4. 31: SELECTED DEVELOPMENTAL INDICATORS- NEARBY STATES AS COMPARISON AND BOTH MADHYA PRADESH AND CHHATTISGARH AS TREATMENTS

VARIABLES	(1) Electricity	(2) Piped Drinking Water	(3) Concrete Housing	(4) Toilet	(5) Clean Cooking Fuel	(6) Television	(7) Internet	(8) Refrigerator	(9) Motorbike
Chhattisgarh X Post	0.09***	0.09***	0.14***	0.05***	0.14***	0.03***	0.08***	0.08***	-0.04***
	(0.006)	(0.006)	(0.008)	(0.008)	(0.007)	(0.008)	(0.005)	(0.007)	(0.008)
Madhya Pradesh X Post	-0.10***	-0.00	-0.15***	-0.10***	-0.11***	-0.15***	0.07***	-0.08***	-0.02***
	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.003)	(0.005)	(0.005)
Post	0.31***	0.14***	0.33***	0.27***	0.22***	0.45***	0.05***	0.19***	0.31***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.001)	(0.002)	(0.003)
Age of head of household	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	0.00	-0.00	0.00	0.00	0.00*	-0.02***	0.00**	-0.00	-0.07***
(Base = Male)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
Education of the Household head	0.01***	0.00***	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***	0.02***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household Size	0.01***	-0.00***	0.01***	0.00***	-0.00***	0.03***	0.00***	0.01***	0.03***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rural	-0.07***	-0.15***	-0.28***	-0.37***	-0.42***	-0.22***	-0.08***	-0.22***	-0.13***
(Base=urban)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)
Religion of the HH (Muslim)	0.00	-0.01***	0.01***	0.07***	-0.00	-0.05***	-0.04***	0.00	-0.07***
(Base= Hindu)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.002)	(0.003)	(0.004)
Religion of the HH (Christian)	0.00	-0.00	0.01*	-0.01	0.00	0.00	0.00	0.00	-0.00
	(0.005)	(0.004)	(0.006)	(0.006)	(0.005)	(0.006)	(0.003)	(0.005)	(0.006)
Religion of the HH (Sikh)	0.04***	0.05***	0.08***	0.13***	0.12***	0.11***	0.06***	0.23***	0.18***
	(0.012)	(0.011)	(0.016)	(0.015)	(0.014)	(0.016)	(0.009)	(0.014)	(0.016)
Religion of the HH (Others)	0.06***	0.06***	0.10***	0.13***	0.20***	0.15***	0.08***	0.18***	0.10***
	(0.009)	(0.009)	(0.012)	(0.012)	(0.011)	(0.012)	(0.007)	(0.011)	(0.012)
Caste of the household(Scheduled Caste)	-0.04***	-0.02***	-0.08***	-0.11***	-0.08***	-0.07***	-0.02***	-0.08***	-0.11***

Table 4. 31 (cont'd)

(Base= General Caste)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)
Caste of the household(Scheduled Tribe)	-0.09***	-0.05***	-0.18***	-0.18***	-0.14***	-0.19***	-0.03***	-0.10***	-0.13***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
Constant	0.61***	0.07***	0.41***	0.36***	0.42***	0.21***	-0.02***	-0.00	-0.04***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.002)	(0.004)	(0.005)
Observations	221,861	221,861	221,861	221,861	221,485	221,861	221,861	221,861	221,861
R-squared	0.254	0.222	0.380	0.415	0.459	0.339	0.143	0.292	0.244

Note: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village

Table 4. 32: SELECTED DEVELOPMENTAL INDICATORS- NEARBY STATES AS COMPARISON AND BOTH UTTAR PRADESH AND UTTARAKHAND AS TREATMENTS

VARIABLES	(1) Electricity	(2) Piped Drinking Water	(3) Concrete Housing	(4) Toilet	(5) Clean Cooking Fuel	(6) Television	(7) Internet	(8) Refrigerator	(9) Motorbike
Uttarakhand X Post	0.17***	0.08***	0.09***	0.06***	0.01	-0.00	0.11***	0.08***	0.15***
	(0.011)	(0.009)	(0.012)	(0.012)	(0.011)	(0.013)	(0.008)	(0.011)	(0.013)
Uttar Pradesh X Post	-0.10***	-0.16***	-0.17***	-0.19***	-0.00	-0.16***	-0.08***	-0.19***	-0.12***
	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)	(0.003)	(0.004)	(0.005)
Post	0.25***	0.23***	0.26***	0.36***	0.15***	0.38***	0.16***	0.31***	0.38***
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)	(0.002)	(0.003)	(0.004)
Age of head of household	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	0.04***	0.00**	0.04***	0.02***	0.04***	0.03***	0.01***	0.03***	-0.02***
(Base = Male)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)
Education of the Household head	0.01***	0.00***	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household Size	0.01***	-0.00***	0.00***	0.00***	-0.01***	0.02***	0.00***	0.01***	0.02***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rural	-0.20***	-0.20***	-0.39***	-0.41***	-0.50***	-0.30***	-0.10***	-0.27***	-0.11***
(Base=urban)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Religion of the HH (Muslim)	0.04***	-0.00	-0.00	0.14***	-0.01***	-0.11***	-0.04***	0.01**	-0.06***
(Base= Hindu)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)
Religion of the HH (Christian)	0.06**	-0.02	0.12***	0.10***	0.08***	0.07**	-0.01	0.11***	0.04
	(0.027)	(0.021)	(0.029)	(0.028)	(0.026)	(0.031)	(0.019)	(0.027)	(0.031)

Table 4. 32 (cont'd)

Religion of the HH (Sikh)	0.06***	0.01	0.09***	0.09***	0.11***	0.10***	0.04***	0.18***	0.13***
	(0.009)	(0.007)	(0.009)	(0.009)	(0.008)	(0.010)	(0.006)	(0.009)	(0.010)
Religion of the HH (Others)	0.03*	0.05***	0.06***	0.14***	0.21***	0.14***	0.05***	0.19***	0.11***
	(0.014)	(0.011)	(0.015)	(0.015)	(0.014)	(0.016)	(0.010)	(0.014)	(0.016)
Caste of the household(Scheduled Caste)	-0.06***	-0.02***	-0.09***	-0.09***	-0.08***	-0.07***	-0.04***	-0.10***	-0.13***
(Base= General Caste)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Caste of the household(Scheduled Tribe)	-0.11***	-0.03***	-0.14***	-0.16***	-0.11***	-0.15***	-0.02***	-0.09***	-0.09***
	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)
Constant	0.48***	0.13***	0.46***	0.38***	0.48***	0.25***	-0.03***	0.05***	-0.11***
	(0.004)	(0.003)	(0.005)	(0.004)	(0.004)	(0.005)	(0.003)	(0.004)	(0.005)
Observations	192,885	192,885	192,885	192,885	192,843	192,885	192,885	192,883	192,878
R-squared	0.358	0.269	0.379	0.459	0.432	0.345	0.176	0.339	0.232

Note: * *p*<0.1; ** *p*<0.05; *** *p*<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village

Table 4. 33: SELECTED HEALTH INDICATORS- BIHAR AS COMPARISON AND JHARKHAND AS TREATMENT

VARIABLES	(1) Govt Institutional Delivery	(2) Infant Death	(3) Underweight	(4) Stunted	(5) Wasted	(6) Tetanus Shot	(7) Polio Vaccine	(8) Measles Vaccine	(9) BCG Vaccine	(10) Health Card
Districts in Jharkhand X Post	0.05***	0.03***	-0.14***	-0.07***	-0.12***	0.05***	0.01	0.01	0.02*	0.09***
	(0.016)	(0.008)	(0.019)	(0.019)	(0.017)	(0.017)	(0.017)	(0.016)	(0.013)	(0.016)
post	0.43***	-0.04***	-0.15***	-0.15***	-0.08***	0.12***	0.33***	0.53***	0.57***	0.35***
	(0.007)	(0.003)	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)	(0.005)	(0.007)
Age of head of household	-0.00	0.00***	-0.00***	-0.00***	0.00	0.00***	-0.00	-0.00**	0.00	0.00
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	-0.02***	-0.01***	-0.00	-0.00	-0.01	0.01	0.00	0.00	0.02***	0.01
(Base = Male)	(0.006)	(0.003)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)
Years of Education Women has Received	0.00	-0.00***	-0.01***	-0.02***	-0.00***	0.01***	0.01***	0.01***	0.01***	0.01***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Rural	0.03***	0.01***	0.04***	0.05***	0.01*	-0.05***	-0.01*	-0.02**	-0.04***	0.01**
(Base=urban)	(0.007)	(0.004)	(0.008)	(0.008)	(0.007)	(0.008)	(0.007)	(0.007)	(0.006)	(0.007)
Household Size	-0.00**	-0.01***	-0.00**	-0.00*	-0.00**	-0.01***	-0.00	-0.00	0.00	0.00
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Religion of the HH (Muslim)	-0.09***	-0.00	-0.01	0.00	0.01	-0.02**	-0.05***	-0.07***	-0.06***	-0.05***
(Base= Hindu)	(0.006)	(0.003)	(0.007)	(0.007)	(0.006)	(0.007)	(0.006)	(0.006)	(0.005)	(0.006)
Religion of the HH (Christian)	-0.06**	0.02	-0.00	-0.03	-0.01	0.02	-0.02	0.00	0.01	-0.02
	(0.030)	(0.015)	(0.034)	(0.034)	(0.030)	(0.032)	(0.030)	(0.029)	(0.024)	(0.030)
Religion of the HH (Sikh)	-0.05	0.02	0.00	-0.00	-0.08	0.03	-0.15	0.01	0.06	0.15*
	(0.089)	(0.045)	(0.098)	(0.098)	(0.086)	(0.095)	(0.091)	(0.088)	(0.072)	(0.089)
Religion of the HH (Others)	-0.03	0.02	0.05**	0.01	0.03	-0.03	0.02	-0.02	0.00	0.01
	(0.020)	(0.010)	(0.023)	(0.023)	(0.020)	(0.021)	(0.020)	(0.020)	(0.016)	(0.020)

Table 4. 33 (cont'd)

Caste of the household(Scheduled Caste)	-0.01*	0.01***	0.06***	0.06***	0.02***	-0.02***	-0.01	-0.03***	-0.01*	-0.02***
(Base= General Caste)	(0.006)	(0.003)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)
Caste of the household(Scheduled Tribe)	-0.04***	0.00	0.02	0.01	0.04***	0.02*	-0.04***	-0.02***	-0.03***	-0.02**
	(0.008)	(0.004)	(0.010)	(0.010)	(0.008)	(0.009)	(0.009)	(0.008)	(0.007)	(0.008)
Constant	0.05***	0.09***	0.63***	0.68***	0.29***	0.49***	0.11***	0.15***	0.28***	0.26***
	(0.011)	(0.006)	(0.013)	(0.013)	(0.011)	(0.012)	(0.011)	(0.011)	(0.009)	(0.011)
Observations	43,471	42,711	39,312	39,242	38,970	43,471	43,471	43,471	43,471	43,471
R-squared	0.143	0.011	0.047	0.055	0.019	0.047	0.107	0.195	0.299	0.139

Note: * *p*<0.1; ** *p*<0.05; *** *p*<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village

Table 4. 34: SELECTED HEALTH INDICATORS- MADHYA PRADESH AS COMPARISON AND CHHATTISGARH AS TREATMENT

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	Govt Institutional Delivery	Infant Death	Underweight	Stunted	Wasted	Tetanus Shot	Polio Vaccine	Measles Vaccine	BCG Vaccine	Health Card
Districts in Chhattisgarh X Post	0.05***	-0.03***	-0.09***	-0.09***	-0.03	0.06***	0.12***	0.00	0.02*	-0.04***
	(0.012)	(0.007)	(0.015)	(0.022)	(0.020)	(0.013)	(0.013)	(0.013)	(0.011)	(0.011)
post	0.55***	-0.04***	-0.09***	-0.13***	-0.01	0.02**	0.27***	0.40***	0.35***	0.41***
	(0.007)	(0.004)	(0.008)	(0.011)	(0.010)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)
Age of head of household	-0.00**	0.00***	-0.00***	-0.00**	-0.00	0.00***	0.00	-0.00	-0.00***	-0.00**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	0.03***	0.00	-0.01	0.01	0.01	-0.01	-0.01	-0.01	0.01	0.00
(Base = Male)	(0.009)	(0.005)	(0.011)	(0.011)	(0.010)	(0.010)	(0.010)	(0.010)	(0.008)	(0.009)
Years of Education Women has Received	0.00***	-0.00***	-0.01***	-0.01***	-0.00***	0.01***	0.01***	0.01***	0.01***	0.01***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Rural	0.00	0.01	0.03***	0.02***	0.02***	-0.05***	-0.05***	-0.04***	-0.04***	-0.06***
(Base=urban)	(0.006)	(0.003)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)
Household Size	-0.00***	-0.01***	-0.00**	-0.00*	-0.00	-0.01***	-0.00**	0.00***	0.00***	0.00**
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Religion of the HH (Muslim)	0.05***	0.00	-0.02	-0.00	-0.02*	0.02*	-0.00	0.00	-0.00	0.00
(Base= Hindu)	(0.010)	(0.006)	(0.012)	(0.013)	(0.011)	(0.011)	(0.011)	(0.011)	(0.009)	(0.009)
Religion of the HH (Christian)	-0.09***	-0.01	-0.03	-0.12***	0.01	0.02	-0.06*	-0.01	0.01	-0.03
	(0.032)	(0.017)	(0.038)	(0.040)	(0.036)	(0.034)	(0.034)	(0.033)	(0.027)	(0.029)
Religion of the HH (Sikh)	-0.18***	-0.05	-0.09	-0.03	-0.04	0.02	0.09	0.11	-0.01	0.02
	(0.062)	(0.034)	(0.072)	(0.075)	(0.068)	(0.067)	(0.066)	(0.065)	(0.054)	(0.058)
Religion of the HH (Others)	-0.06**	0.01	0.04	-0.08*	-0.03	0.07*	0.04	0.10***	0.08***	0.05
	(0.032)	(0.017)	(0.038)	(0.044)	(0.041)	(0.034)	(0.034)	(0.033)	(0.027)	(0.029)

Table 4. 34 (cont'd)

Caste of the household(Scheduled Caste)	0.01	0.00	0.03***	0.06***	0.01	-0.05***	-0.03***	-0.03***	-0.03***	-0.03***
(Base= General Caste)	(0.006)	(0.003)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)
Caste of the household(Scheduled Tribe)	-0.07***	0.01**	0.05***	0.06***	0.03***	-0.02***	-0.08***	-0.06***	-0.04***	-0.07***
	(0.006)	(0.003)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.005)	(0.006)
Constant	0.15***	0.11***	0.61***	0.63***	0.29***	0.61***	0.19***	0.28***	0.50***	0.40***
	(0.010)	(0.006)	(0.012)	(0.015)	(0.013)	(0.011)	(0.011)	(0.011)	(0.009)	(0.009)
Observations	39,555	39,004	35,647	32,613	32,439	39,555	39,555	39,555	39,555	39,555
R-squared	0.244	0.015	0.050	0.044	0.015	0.057	0.129	0.148	0.184	0.235

Note: * *p*<0.1; ** *p*<0.05; *** *p*<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village

Table 4. 35: SELECTED HEALTH INDICATORS- UTTAR PRADESH AS COMPARISON AND UTTARAKHAND AS TREATMENT

VARIABLES	(1) Govt Institutional Delivery	(2) Infant Death	(3) Underweight	(4) Stunted	(5) Wasted	(6) Tetanus Shot	(7) Polio Vaccine	(8) Measles Vaccine	(9) BCG Vaccine	(10) Health Card
Districts in Uttarakhand X Post	0.05*	0.02	-0.05	-0.14***	-0.12***	-0.02	-0.00	0.10***	0.14***	-0.03
	(0.025)	(0.015)	(0.031)	(0.031)	(0.025)	(0.027)	(0.026)	(0.027)	(0.024)	(0.027)
post	0.37***	-0.03***	-0.12***	-0.14***	-0.02***	0.10***	0.21***	0.33***	0.35***	0.23***
	(0.005)	(0.003)	(0.007)	(0.007)	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)
Age of head of household	-0.00	0.00***	-0.00***	-0.00***	-0.00	0.00***	0.00***	0.00	0.00***	0.00***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	0.01	-0.00	-0.00	0.02**	-0.01	0.00	0.01	0.01	0.01*	-0.01
(Base = Male)	(0.006)	(0.004)	(0.007)	(0.007)	(0.006)	(0.007)	(0.006)	(0.007)	(0.006)	(0.006)
Years of Education Women has Received	0.00***	-0.00***	-0.01***	-0.02***	-0.00***	0.01***	0.01***	0.01***	0.01***	0.01***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rural	0.09***	0.02***	0.02***	0.04***	-0.00	-0.07***	-0.02***	-0.00	-0.01**	-0.02***
(Base=urban)	(0.005)	(0.003)	(0.006)	(0.006)	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)
Household Size	-0.00***	-0.01***	-0.00	0.00	-0.00***	-0.01***	-0.00***	-0.00	0.00***	0.00
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Religion of the HH (Muslim)	-0.04***	-0.01**	-0.01**	-0.00	-0.00	-0.04***	-0.04***	-0.09***	-0.08***	-0.07***
(Base= Hindu)	(0.005)	(0.003)	(0.006)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.005)
Religion of the HH (Christian)	0.05	-0.04	-0.24**	-0.23**	-0.01	0.01	0.16*	0.00	0.18**	0.26***
	(0.084)	(0.052)	(0.101)	(0.101)	(0.082)	(0.091)	(0.085)	(0.089)	(0.079)	(0.089)
Religion of the HH (Sikh)	-0.01	-0.02	-0.18***	-0.24***	-0.05	0.15***	0.15***	0.07*	0.08**	0.13***
	(0.040)	(0.024)	(0.047)	(0.047)	(0.038)	(0.044)	(0.041)	(0.043)	(0.038)	(0.042)

Table 4. 35 (cont'd)

Religion of the HH (Others)	0.08	-0.05*	-0.02	-0.05	-0.10*	0.12**	0.04	0.07	0.10**	0.20***
	(0.053)	(0.031)	(0.062)	(0.062)	(0.051)	(0.058)	(0.054)	(0.056)	(0.050)	(0.056)
Caste of the household(Scheduled Caste)	0.02***	-0.00	0.04***	0.05***	0.00	-0.01***	-0.01***	-0.01*	-0.00	0.02***
(Base= General Caste)	(0.005)	(0.003)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Caste of the household(Scheduled Tribe)	-0.05***	0.01*	0.01	0.01	0.01	-0.02**	-0.05***	-0.04***	-0.04***	-0.03***
	(0.008)	(0.005)	(0.010)	(0.010)	(0.008)	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)
Constant	0.03***	0.12***	0.61***	0.70***	0.24***	0.49***	0.12***	0.20***	0.38***	0.34***
	(0.009)	(0.005)	(0.011)	(0.011)	(0.009)	(0.010)	(0.009)	(0.009)	(0.008)	(0.009)
Observations	57,391	56,114	50,431	50,394	50,120	57,391	57,391	57,391	57,391	57,391
R-squared	0.161	0.015	0.056	0.073	0.019	0.064	0.093	0.136	0.182	0.119

Note: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village

Table 4. 36: SELECTED HEALTH INDICATORS- BORDERING DISTRICTS IN BIHAR AS COMPARISON AND BORDERING DISTRICTS IN JHARKHAND AS TREATMENT

VARIABLES	(1) Govt Institutional Delivery	(2) Infant Death	(3) Underweight	(4) Stunted	(5) Wasted	(6) Tetanus Shot	(7) Polio Vaccine	(8) Measles Vaccine	(9) BCG Vaccine	(10) Health Card
Jharkhand Border Dist. # Post	-0.01	-0.02*	-0.16***	-0.12***	-0.14***	0.06***	0.01	0.01	-0.01	0.01
	(0.019)	(0.010)	(0.023)	(0.022)	(0.020)	(0.020)	(0.020)	(0.019)	(0.015)	(0.020)
Post Split	0.40***	-0.03***	-0.16***	-0.21***	-0.08***	0.13***	0.33***	0.54***	0.58***	0.25***
	(0.011)	(0.006)	(0.013)	(0.013)	(0.012)	(0.012)	(0.012)	(0.011)	(0.009)	(0.011)
Age of head of household	-0.00	0.00**	-0.00***	-0.00***	-0.00	0.00***	-0.00	-0.00	0.00**	0.00
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	-0.03***	-0.01*	-0.02**	-0.02*	-0.01	0.01	-0.02*	-0.00	0.01	-0.02***
(Base = Male)	(0.010)	(0.005)	(0.011)	(0.011)	(0.010)	(0.010)	(0.010)	(0.009)	(0.007)	(0.010)
Education of the Household head	0.00***	-0.00***	-0.02***	-0.02***	-0.00***	0.01***	0.01***	0.01***	0.01***	0.01***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Household Size	-0.01	0.01**	0.03**	0.03**	0.03**	-0.06***	-0.03**	-0.03**	-0.05***	-0.02
	(0.011)	(0.005)	(0.012)	(0.012)	(0.011)	(0.011)	(0.011)	(0.010)	(0.008)	(0.011)
Rural	-0.00**	-0.00***	-0.00	-0.00	-0.00	-0.01***	0.00	0.00	0.00	0.00
(Base=urban)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Religion of the HH (Muslim)	-0.10***	-0.01**	-0.02*	-0.00	0.00	-0.00	-0.07***	-0.06***	-0.04***	-0.05***
(Base= Hindu)	(0.010)	(0.005)	(0.011)	(0.011)	(0.010)	(0.011)	(0.010)	(0.010)	(0.008)	(0.010)
Religion of the HH (Christian)	-0.05	0.03	0.02	0.03	-0.01	0.04	-0.03	-0.04	0.03	-0.08**
	(0.040)	(0.020)	(0.046)	(0.046)	(0.042)	(0.042)	(0.041)	(0.039)	(0.031)	(0.040)
Religion of the HH (Sikh)	0.14	-0.05	0.43	0.23	0.23	-0.22	0.28	0.33	0.14	0.29
	(0.312)	(0.155)	(0.334)	(0.330)	(0.299)	(0.326)	(0.319)	(0.304)	(0.242)	(0.312)

Table 4. 36 (cont'd)

Religion of the HH (Others)	-0.12***	0.04**	0.05	-0.04	0.08**	0.05	0.02	0.04	0.06**	0.05
	(0.036)	(0.018)	(0.043)	(0.043)	(0.039)	(0.038)	(0.037)	(0.035)	(0.028)	(0.036)
Caste of the household(Scheduled Caste)	-0.03***	0.00	0.08***	0.07***	0.01	-0.04***	-0.03***	-0.04***	-0.02***	-0.04***
(Base= General Caste)	(0.009)	(0.004)	(0.010)	(0.010)	(0.009)	(0.009)	(0.009)	(0.009)	(0.007)	(0.009)
Caste of the household(Scheduled Tribe)	-0.06***	-0.00	0.00	-0.03*	0.04***	0.00	-0.06***	-0.00	-0.01	-0.01
	(0.012)	(0.006)	(0.014)	(0.014)	(0.013)	(0.013)	(0.013)	(0.012)	(0.010)	(0.012)
Constant	0.12***	0.09***	0.67***	0.74***	0.30***	0.51***	0.14***	0.14***	0.28***	0.32***
	(0.017)	(0.008)	(0.019)	(0.019)	(0.017)	(0.017)	(0.017)	(0.016)	(0.013)	(0.017)
Observations	18,512	18,246	16,820	16,807	16,703	18,512	18,512	18,512	18,512	18,512
R-squared	0.122	0.010	0.047	0.064	0.015	0.051	0.101	0.202	0.321	0.132

Note: * *p*<0.1; ** *p*<0.05; *** *p*<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village

Table 4. 37: SELECTED HEALTH INDICATORS- BORDERING DISTRICTS IN MADHYA PRADESH AS COMPARISON AND BORDERING DISTRICTS IN CHHATTISGARH AS TREATMENT

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	Govt Institutional Delivery	Infant Death	Underweight	Stunted	Wasted	Tetanus Shot	Polio Vaccine	Measles Vaccine	BCG Vaccine	Health Card
Chhattisgarh Border Dist. # Post	-0.02	-0.02*	-0.06**	-0.03	-0.12***	0.06**	0.12***	0.06***	0.06***	0.12***
	(0.024)	(0.013)	(0.029)	(0.041)	(0.039)	(0.025)	(0.024)	(0.025)	(0.019)	(0.022)
Post Split	0.53***	-0.04***	-0.17***	-0.26***	0.03	0.21***	0.29***	0.49***	0.44***	0.47***
	(0.020)	(0.011)	(0.024)	(0.032)	(0.030)	(0.021)	(0.021)	(0.021)	(0.016)	(0.019)
Age of head of household	-0.00	0.00***	0.00	0.00	-0.00	0.00***	0.00	-0.00	-0.00**	-0.00
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	0.01	-0.01	-0.00	0.02	0.01	-0.04*	-0.03	0.01	0.02	-0.00
(Base = Male)	(0.019)	(0.011)	(0.022)	(0.022)	(0.020)	(0.021)	(0.020)	(0.020)	(0.016)	(0.018)
Education of the Household head	0.01***	-0.00***	-0.01***	-0.01***	-0.00	0.01***	0.01***	0.00***	0.01***	0.01***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Household Size	0.06***	-0.01	0.04**	0.04**	-0.01	-0.09***	-0.03*	-0.02	0.00	-0.03**
	(0.015)	(0.008)	(0.017)	(0.017)	(0.016)	(0.016)	(0.015)	(0.015)	(0.012)	(0.014)
Rural	-0.01***	-0.01***	-0.00	-0.00	-0.00*	-0.01***	-0.00	0.00**	0.01***	0.00
(Base=urban)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Religion of the HH (Muslim)	0.07*	-0.03	-0.08*	-0.06	-0.02	0.03	0.01	0.01	0.02	0.02
(Base= Hindu)	(0.035)	(0.020)	(0.042)	(0.041)	(0.039)	(0.038)	(0.037)	(0.037)	(0.029)	(0.033)
Religion of the HH (Christian)	-0.29***	-0.00	-0.14	-0.12	-0.12	-0.00	-0.04	0.08	0.02	-0.11
	(0.075)	(0.043)	(0.093)	(0.089)	(0.083)	(0.081)	(0.078)	(0.078)	(0.062)	(0.071)
Religion of the HH (Sikh)	-0.66**	-0.05	-0.24	-0.06	-0.29	0.17	0.36	0.20	0.07	0.10
	(0.277)	(0.153)	(0.306)	(0.291)	(0.271)	(0.299)	(0.288)	(0.289)	(0.229)	(0.260)
Religion of the HH (Others)	0.06	0.11**	0.17	-0.10	0.14	0.19**	-0.05	-0.01	0.06	0.06
	(0.081)	(0.045)	(0.105)	(0.140)	(0.131)	(0.088)	(0.085)	(0.085)	(0.067)	(0.076)
Caste of the household(Scheduled Caste)	0.00	0.02**	0.01	0.02	-0.00	-0.05***	-0.02	-0.05***	-0.06***	-0.08***

Table 4. 37 (cont'd)

(Base= General Caste)	(0.013)	(0.007)	(0.016)	(0.017)	(0.016)	(0.014)	(0.014)	(0.014)	(0.011)	(0.012)
Caste of the household(Scheduled Tribe)	-0.07***	0.01	0.06***	0.06***	0.01	-0.01	-0.05***	-0.06***	-0.03***	-0.08***
	(0.012)	(0.007)	(0.014)	(0.014)	(0.013)	(0.013)	(0.013)	(0.013)	(0.010)	(0.011)
Constant	0.04	0.09***	0.61***	0.67***	0.37***	0.52***	0.11***	0.25***	0.42***	0.35***
	(0.024)	(0.013)	(0.028)	(0.032)	(0.030)	(0.026)	(0.025)	(0.025)	(0.020)	(0.022)
Observations	8,063	7,959	7,305	6,919	6,888	8,063	8,063	8,063	8,063	8,063
R-squared	0.251	0.013	0.063	0.056	0.014	0.087	0.169	0.171	0.263	0.260

Note: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village

Table 4. 38: SELECTED HEALTH INDICATORS- BORDERING DISTRICTS IN UTTAR PRADESH AS COMPARISON AND BORDERING DISTRICTS IN UTTARAKHAND AS TREATMENT

VARIABLES	(1) Govt Institutional Delivery	(2) Infant Death	(3) Underweight	(4) Stunted	(5) Wasted	(6) Tetanus Shot	(7) Polio Vaccine	(8) Measles Vaccine	(9) BCG Vaccine	(10) Health Card
Uttarakhand Border Dist. # Post	-0.01	0.01	-0.07**	-0.04	0.03	0.20***	0.08***	0.21***	0.28***	0.02
	(0.028)	(0.017)	(0.036)	(0.036)	(0.030)	(0.032)	(0.030)	(0.031)	(0.027)	(0.032)
Post Split	0.27***	-0.03***	-0.10***	-0.25***	0.03**	0.19***	0.28***	0.39***	0.43***	0.15***
	(0.012)	(0.007)	(0.017)	(0.017)	(0.014)	(0.014)	(0.013)	(0.014)	(0.012)	(0.014)
Age of head of household	-0.00	0.00**	-0.00*	-0.00	-0.00	0.00***	0.00**	0.00	0.00	0.00***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	-0.02	0.02*	-0.00	0.02	-0.00	-0.02	0.02	-0.00	-0.00	-0.00
(Base = Male)	(0.015)	(0.009)	(0.017)	(0.017)	(0.014)	(0.016)	(0.016)	(0.016)	(0.014)	(0.016)
Education of the Household head	-0.00	-0.00***	-0.02***	-0.02***	-0.00***	0.01***	0.01***	0.01***	0.01***	0.01***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Household Size	0.07***	0.01	0.03***	0.02	0.01	-0.05***	-0.02*	-0.01	-0.03***	-0.01
	(0.010)	(0.006)	(0.012)	(0.012)	(0.010)	(0.011)	(0.010)	(0.011)	(0.009)	(0.011)
Rural	-0.00*	-0.01***	-0.00	-0.00	0.00	-0.01***	-0.00	-0.00	0.00***	-0.00
(Base=urban)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)
Religion of the HH (Muslim)	-0.05***	-0.03***	-0.03***	-0.04***	-0.01	-0.04***	-0.05***	-0.09***	-0.08***	-0.08***
(Base= Hindu)	(0.010)	(0.006)	(0.012)	(0.012)	(0.010)	(0.011)	(0.011)	(0.011)	(0.009)	(0.011)
Religion of the HH (Christian)	0.08	-0.06	-0.26**	-0.22*	-0.08	-0.08	0.15	0.04	0.17**	0.22**
	(0.089)	(0.057)	(0.113)	(0.113)	(0.093)	(0.100)	(0.096)	(0.098)	(0.084)	(0.100)
Religion of the HH (Sikh)	0.01	0.00	-0.15***	-0.25***	-0.01	0.12**	0.11**	0.09*	0.09**	0.10*
	(0.047)	(0.028)	(0.057)	(0.056)	(0.047)	(0.053)	(0.051)	(0.052)	(0.044)	(0.053)
Religion of the HH (Others)	0.06	-0.07	0.14	-0.15	-0.00	0.18**	0.17**	0.23***	0.25***	0.23**
	(0.081)	(0.047)	(0.111)	(0.105)	(0.091)	(0.091)	(0.087)	(0.089)	(0.076)	(0.091)
Caste of the household(Scheduled Caste)	0.06***	-0.01	0.03**	0.04***	0.00	-0.03**	-0.01	-0.00	0.02*	0.02*

Table 4. 38 (cont'd)

(Base= General Caste)	(0.012)	(0.007)	(0.015)	(0.015)	(0.012)	(0.014)	(0.013)	(0.014)	(0.012)	(0.014)
Caste of the household(Scheduled Tribe)	-0.03*	0.02*	-0.02	-0.02	-0.01	0.01	-0.05**	-0.00	-0.01	-0.00
	(0.018)	(0.011)	(0.024)	(0.024)	(0.020)	(0.020)	(0.019)	(0.020)	(0.017)	(0.020)
Constant	0.04**	0.12***	0.61***	0.80***	0.17***	0.41***	0.11***	0.24***	0.38***	0.36***
	(0.019)	(0.011)	(0.024)	(0.023)	(0.020)	(0.021)	(0.020)	(0.021)	(0.018)	(0.021)
Observations	10,867	10,652	9,558	9,563	9,515	10,867	10,867	10,867	10,867	10,867
R-squared	0.093	0.017	0.056	0.090	0.011	0.081	0.113	0.140	0.204	0.102

Note: * *p*<0.1; ** *p*<0.05; *** *p*<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village

Table 4. 39: SELECTED HEALTH INDICATORS- NEARBY STATES AS COMPARISON AND BOTH BIHAR AND JHARKHAND AS TREATMENTS

VARIABLES	(1) Govt Institutional Delivery	(2) Infant Death	(3) Underweight	(4) Stunted	(5) Wasted	(6) Tetanus Shot	(7) Polio Vaccine	(8) Measles Vaccine	(9) BCG Vaccine	(10) Health Card
Jharkhand X Post	0.05***	-0.03***	-0.14***	-0.05**	-0.09***	0.19***	0.10***	0.12***	0.22***	0.10***
	(0.017)	(0.008)	(0.020)	(0.021)	(0.019)	(0.017)	(0.017)	(0.017)	(0.014)	(0.016)
Bihar X Post	0.01	0.01*	0.01	-0.00	-0.03***	0.14***	-0.12***	0.11***	0.25***	0.02**
	(0.010)	(0.005)	(0.011)	(0.014)	(0.013)	(0.010)	(0.010)	(0.010)	(0.008)	(0.009)
Post	0.42***	-0.04***	-0.15***	-0.14***	-0.04***	-0.02**	0.45***	0.42***	0.32***	0.33***
	(0.008)	(0.004)	(0.009)	(0.012)	(0.011)	(0.008)	(0.008)	(0.007)	(0.006)	(0.007)
Age of head of household	-0.00	0.00***	-0.00***	-0.00***	-0.00	0.00***	-0.00	-0.00**	-0.00	0.00
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	-0.00	-0.01***	-0.00	-0.00	-0.01*	0.00	-0.01*	0.00	0.01***	0.00
(Base = Male)	(0.005)	(0.003)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)
Education of the Household head	0.00***	-0.00***	-0.02***	-0.02***	-0.00***	0.01***	0.01***	0.01***	0.01***	0.01***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household Size	0.01*	0.01***	0.03***	0.03***	0.02***	-0.03***	0.00	-0.01*	-0.02***	-0.00
	(0.005)	(0.003)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)
Rural	-0.00***	-0.01***	-0.00***	-0.00*	-0.00**	-0.01***	-0.00	-0.00	0.00*	0.00**
(Base=urban)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Religion of the HH (Muslim)	-0.11***	-0.00	0.01	0.02***	0.01	-0.02***	-0.05***	-0.07***	-0.06***	-0.05***
(Base= Hindu)	(0.005)	(0.003)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)
Religion of the HH (Christian)	-0.05**	0.01	-0.01	-0.03	-0.02	0.00	-0.03	-0.00	0.00	-0.02
	(0.021)	(0.010)	(0.024)	(0.024)	(0.021)	(0.021)	(0.021)	(0.021)	(0.017)	(0.019)

Table 4. 39 (cont'd)

Religion of the HH (Sikh)	-0.11	0.03	-0.00	-0.02	-0.07	-0.01	-0.14*	-0.10	0.04	0.11
	(0.081)	(0.041)	(0.094)	(0.093)	(0.082)	(0.081)	(0.082)	(0.080)	(0.064)	(0.074)
Religion of the HH (Others)	-0.10***	0.02**	0.06***	0.04**	0.04***	-0.05***	-0.02	-0.07***	-0.02	-0.01
	(0.014)	(0.007)	(0.016)	(0.016)	(0.014)	(0.014)	(0.014)	(0.014)	(0.011)	(0.013)
Caste of the household(Scheduled Caste)	-0.00	0.01**	0.04***	0.04***	0.02***	-0.02***	-0.01	-0.02***	-0.00	-0.01***
(Base= General Caste)	(0.005)	(0.002)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)
Caste of the household(Scheduled Tribe)	-0.00	0.00	0.03***	0.03***	0.04***	0.02**	-0.05***	-0.02***	-0.01**	-0.00
	(0.006)	(0.003)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)
Constant	0.14***	0.09***	0.62***	0.65***	0.28***	0.58***	0.13***	0.21***	0.38***	0.37***
	(0.009)	(0.004)	(0.010)	(0.011)	(0.009)	(0.009)	(0.009)	(0.009)	(0.007)	(0.008)
Observations	64,789	63,847	58,155	56,301	55,913	64,789	64,789	64,789	64,789	64,789
R-squared	0.180	0.014	0.070	0.078	0.023	0.088	0.163	0.195	0.275	0.202

Note: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village

Table 4. 40: SELECTED HEALTH INDICATORS- NEARBY STATES AS COMPARISON AND BOTH MADHYA PRADESH AND CHHATTISGARH AS TREATMENTS

VARIABLES	(1) Govt Institutional Delivery	(2) Infant Death	(3) Underweight	(4) Stunted	(5) Wasted	(6) Tetanus Shot	(7) Polio Vaccine	(8) Measles Vaccine	(9) BCG Vaccine	(10) Health Card
Chhattisgarh X Post	0.15***	0.02***	-0.13***	-0.09***	-0.05***	0.13***	0.13***	0.09***	0.09***	0.15***
	(0.013)	(0.007)	(0.016)	(0.023)	(0.020)	(0.014)	(0.014)	(0.014)	(0.011)	(0.013)
Madhya Pradesh X Post	0.20***	-0.00	-0.04***	-0.00	-0.03**	0.06***	0.01	0.09***	0.11***	0.19***
	(0.008)	(0.004)	(0.010)	(0.014)	(0.013)	(0.009)	(0.009)	(0.009)	(0.007)	(0.008)
Post	0.37***	-0.04***	-0.05***	-0.12***	0.02***	-0.04***	0.26***	0.30***	0.24***	0.22***
	(0.005)	(0.002)	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)
Age of head of household	-0.00***	0.00***	-0.00***	-0.00***	-0.00	0.00***	0.00**	-0.00	0.00	0.00***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	0.04***	0.00	-0.00	-0.01	0.01	-0.01	-0.01	-0.01**	0.00	0.01
(Base = Male)	(0.005)	(0.003)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)
Education of the Household head	-0.00***	-0.00***	-0.01***	-0.01***	-0.00***	0.01***	0.01***	0.01***	0.01***	0.01***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household Size	0.01***	0.01***	0.02***	0.02***	0.01***	-0.04***	-0.02***	-0.03***	-0.02***	-0.02***
	(0.004)	(0.002)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)
Rural	0.00	-0.01***	-0.00	-0.00	-0.00***	-0.01***	-0.00***	-0.00	0.00***	-0.00
(Base=urban)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Religion of the HH (Muslim)	0.01*	-0.00	-0.00	0.01	-0.01	-0.02***	-0.02***	-0.04***	-0.03***	-0.00
(Base= Hindu)	(0.006)	(0.003)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)
Religion of the HH (Christian)	0.05***	-0.02***	0.01	-0.01	0.04***	0.02	-0.04***	-0.01	-0.00	-0.01
	(0.012)	(0.006)	(0.013)	(0.014)	(0.012)	(0.012)	(0.012)	(0.012)	(0.010)	(0.012)
Religion of the HH (Sikh)	0.00	-0.02*	-0.03	-0.04	-0.02	0.07**	0.07**	0.09***	0.08***	0.08***
	(0.028)	(0.014)	(0.031)	(0.032)	(0.028)	(0.029)	(0.029)	(0.029)	(0.024)	(0.027)
Religion of the HH (Others)	-0.05**	0.01	0.01	-0.05	-0.02	0.07***	0.06**	0.04	0.05**	0.02
	(0.026)	(0.013)	(0.030)	(0.033)	(0.029)	(0.027)	(0.027)	(0.027)	(0.022)	(0.025)
Caste of the household(Scheduled Caste)	0.04***	0.00	0.03***	0.04***	0.01***	-0.04***	-0.03***	-0.02***	-0.02***	-0.01***
(Base= General Caste)	(0.004)	(0.002)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)
Caste of the household(Scheduled Tribe)	-0.02***	0.01***	0.06***	0.05***	0.03***	-0.02***	-0.07***	-0.05***	-0.03***	-0.03***

Table 4. 40 (cont'd)

	(0.004)	(0.002)	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)
Constant	0.14***	0.10***	0.55***	0.60***	0.25***	0.67***	0.20***	0.35***	0.55***	0.40***
	(0.007)	(0.003)	(0.008)	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)
Observations	93,951	92,678	83,735	78,976	78,491	93,951	93,951	93,951	93,951	93,951
R-squared	0.224	0.018	0.064	0.064	0.024	0.061	0.124	0.133	0.162	0.171

Note: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village

Table 4. 41: SELECTED HEALTH INDICATORS- NEARBY STATES AS COMPARISON AND BOTH UTTAR PRADESH AND JHARKHAND AS TREATMENTS

VARIABLES	(1) Govt Institutional Delivery	(2) Infant Death	(3) Underweight	(4) Stunted	(5) Wasted	(6) Tetanus Shot	(7) Polio Vaccine	(8) Measles Vaccine	(9) BCG Vaccine	(10) Health Card
Uttarakhand X Post	0.18***	0.02	-0.13***	-0.16***	0.04*	0.00	0.08***	0.08***	0.10***	0.01
	(0.024)	(0.014)	(0.029)	(0.030)	(0.025)	(0.026)	(0.025)	(0.026)	(0.022)	(0.025)
Uttar Pradesh X Post	-0.14***	0.00	-0.08***	-0.02*	-0.07***	0.02**	-0.08***	0.02**	0.04***	0.04***
	(0.008)	(0.004)	(0.009)	(0.010)	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)	(0.008)
Post	0.51***	-0.04***	-0.03***	-0.12***	0.05***	0.08***	0.29***	0.31***	0.32***	0.18***
	(0.007)	(0.004)	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)	(0.007)
Age of head of household	-0.00***	0.00***	-0.00***	-0.00***	-0.00	0.00***	0.00***	0.00	0.00***	0.00***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	0.01**	-0.00	-0.01	0.01*	-0.01**	0.00	0.00	0.00	0.01	-0.01
(Base = Male)	(0.005)	(0.003)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Education of the Household head	0.00***	-0.00***	-0.01***	-0.01***	-0.00***	0.01***	0.01***	0.01***	0.01***	0.01***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household Size	0.06***	0.01***	0.01***	0.03***	-0.01**	-0.06***	-0.03***	-0.02***	-0.02***	-0.03***
	(0.004)	(0.002)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Rural	-0.00***	-0.01***	-0.00	0.00	-0.00***	-0.01***	-0.00***	-0.00	0.00***	0.00
(Base=urban)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Religion of the HH (Muslim)	-0.05***	-0.00	-0.01	0.00	0.00	-0.04***	-0.04***	-0.09***	-0.08***	-0.07***
(Base= Hindu)	(0.004)	(0.002)	(0.005)	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)
Religion of the HH (Christian)	0.09	-0.03	-0.22***	-0.18**	-0.02	-0.01	0.12*	-0.00	0.14**	0.20***
	(0.069)	(0.040)	(0.080)	(0.081)	(0.068)	(0.074)	(0.070)	(0.072)	(0.063)	(0.072)
Religion of the HH (Sikh)	-0.01	-0.01	-0.06***	-0.09***	-0.02	0.10***	0.06***	0.05**	0.07***	0.08***
	(0.018)	(0.010)	(0.020)	(0.021)	(0.017)	(0.019)	(0.018)	(0.019)	(0.016)	(0.019)

Table 4. 41 (cont'd)

Religion of the HH (Others)	-0.04	-0.02	-0.03	-0.05	-0.06*	0.10***	0.06*	0.02	0.08**	0.10***
	(0.034)	(0.019)	(0.039)	(0.040)	(0.034)	(0.037)	(0.035)	(0.036)	(0.031)	(0.036)
Caste of the household(Scheduled Caste)	0.04***	-0.00	0.04***	0.05***	0.01***	-0.02***	-0.01***	-0.02***	-0.01***	0.01***
(Base= General Caste)	(0.004)	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Caste of the household(Scheduled Tribe)	-0.03***	0.01*	0.04***	0.04***	0.02***	-0.02***	-0.05***	-0.05***	-0.04***	-0.03***
	(0.006)	(0.003)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)
Constant	0.06***	0.11***	0.57***	0.66***	0.24***	0.51***	0.14***	0.25***	0.42***	0.37***
	(0.007)	(0.004)	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)	(0.007)
Observations	93,808	92,018	83,198	81,786	81,305	93,808	93,808	93,808	93,808	93,808
R-squared	0.193	0.017	0.058	0.075	0.023	0.071	0.123	0.142	0.189	0.129

Note: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village

APPENDIX E: TABLES- RESULTS OF PARALLEL TREND TESTS

Table 4. 42: TESTING PARALLEL TREND - ADJACENT STATES AS COMPARISON AND BOTH PARENT AND NEW STATES AS TWO TREATMENTS

VARIABLES	(1) HHH Education	(2) Electricity	(3) Piped Drinking Water	(4) Concrete house	(5) Toilet	(6) Clean Cooking Fuel	(7) Television	(8) Refrigerator	(9) Motorcycle
New States X Post	-0.188	-0.084	0.015	-0.037	-0.080	-0.139*	-0.090	-0.044	-0.040
	(0.210)	(0.081)	(0.012)	(0.030)	(0.089)	(0.080)	(0.090)	(0.088)	(0.048)
Parent State X Post	0.294	-0.051	-0.002	-0.029*	-0.037	-0.099	-0.076	-0.035	-0.029
	(0.291)	(0.055)	(0.002)	(0.015)	(0.044)	(0.094)	(0.075)	(0.034)	(0.024)
Post	-0.138**	0.105***	0.001	0.072***	0.073***	0.170***	0.155***	0.046***	0.036***
	(0.062)	(0.003)	(0.001)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)
New States	-1.914**	-0.339***	-0.006	-0.206***	-0.062	-0.022	-0.307***	-0.068**	0.039
	(0.888)	(0.047)	(0.009)	(0.044)	(0.039)	(0.035)	(0.046)	(0.034)	(0.035)
Parent States	0.846	-0.184***	-0.036***	0.291***	0.186***	0.143***	0.092***	0.161***	0.077***
	(0.667)	(0.036)	(0.007)	(0.033)	(0.029)	(0.027)	(0.034)	(0.026)	(0.026)
Age of HH Head	-0.050***	0.001***	0.000	0.001***	0.002***	0.001***	0.002***	0.001***	0.001***
	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of HH Head= Female	-3.096***	0.004	-0.001	0.013***	0.011***	-0.006*	0.001	-0.006*	-0.007**
(Base = Male)	(0.080)	(0.004)	(0.001)	(0.004)	(0.004)	(0.003)	(0.004)	(0.003)	(0.003)
Education of the HH Head		0.008***	-0.000	0.008***	0.009***	0.008***	0.010***	0.006***	0.006***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household Size	0.028***	0.010***	0.000	0.002***	0.002***	-0.003***	0.014***	0.001***	0.007***
	(0.008)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rural	-3.560***	-0.351***	0.010***	-0.409***	-0.545***	-0.384***	-0.378***	-0.165***	-0.137***
(Base=urban)	(0.059)	(0.003)	(0.001)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)
Religion of the HH (Muslim)	-1.991***	-0.030***	-0.003***	-0.053***	0.039***	-0.054***	-0.084***	-0.035***	-0.043***
(Base= Hindu)	(0.077)	(0.004)	(0.001)	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)
	1.140***	-0.040***	-0.004*	0.030***	0.021**	0.011	0.003	0.046***	0.030***

Table 4. 42 (cont'd)

Religion of the HH (Christian)									
	(0.217)	(0.012)	(0.002)	(0.011)	(0.010)	(0.009)	(0.011)	(0.008)	(0.009)
Religion of the HH (Sikh)	0.167	0.090***	-0.004	0.088***	0.129***	0.129***	0.114***	0.145***	0.113***
	(0.349)	(0.019)	(0.003)	(0.017)	(0.015)	(0.014)	(0.018)	(0.014)	(0.014)
Religion of the HH (Others)	0.594***	-0.011	-0.001	0.048***	0.039***	0.072***	0.082***	0.069***	0.052***
	(0.166)	(0.009)	(0.002)	(0.008)	(0.007)	(0.007)	(0.009)	(0.006)	(0.007)
Caste of the household(SC)	-2.187***	-0.111***	-0.002**	-0.094***	-0.092***	-0.068***	-0.090***	-0.049***	-0.055***
(Base= General Caste)	(0.067)	(0.004)	(0.001)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Caste of the household(ST)	-2.160***	-0.123***	0.002***	-0.096***	-0.098***	-0.077***	-0.105***	-0.045***	-0.051***
	(0.074)	(0.004)	(0.001)	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)
Constant	10.963***	0.774***	0.023***	0.316***	0.549***	0.247***	0.241***	0.019	0.012
	(0.607)	(0.032)	(0.006)	(0.030)	(0.027)	(0.024)	(0.031)	(0.024)	(0.024)
Observations	107,841	107,841	107,841	107,841	107,841	106,223	107,841	107,838	107,830
R-squared	0.111	0.412	0.104	0.350	0.501	0.430	0.326	0.168	0.137

Note: * *p*<0.1; ** *p*<0.05; *** *p*<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

Table 4. 43: TESTING PARALLEL TREND (HEALTH INDICATORS) - ADJACENT STATES AS COMPARISON AND BOTH PARENT AND NEW STATES AS TWO TREATMENTS

VARIABLES	(1) Govt Institutional Delivery	(2) Infant Death	(3) Underweight	(4) Stunted	(5) Wasted	(6) Tetanus Shot	(7) Polio Vaccine	(8) Measles Vaccine	(9) BCG Vaccine
New State * Dummy Post	-0.035	0.014	0.000	-0.026	0.092	0.069	0.050	-0.094***	-0.017
	(0.026)	(0.014)	(0.028)	(0.048)	(0.073)	(0.072)	(0.048)	(0.021)	(0.023)
Old State * Dummy Post	-0.034	0.014	-0.022*	-0.036	-0.032	0.060	0.089	-0.026	-0.077
	(0.027)	(0.017)	(0.013)	(0.025)	(0.024)	(0.050)	(0.088)	(0.020)	(0.061)
Dummy Post	0.025***	-0.011**	-0.013	0.016	0.002	0.116***	-0.233***	0.030***	0.119***
	(0.005)	(0.005)	(0.009)	(0.011)	(0.010)	(0.007)	(0.006)	(0.007)	(0.008)
New State	-0.048	0.011	0.199*	0.157	-0.005	-0.335***	-0.172**	-0.204**	-0.201**
	(0.067)	(0.059)	(0.112)	(0.341)	(0.301)	(0.094)	(0.076)	(0.091)	(0.098)
Old State	0.167***	-0.010	-0.152**	-0.094	-0.066	-0.006	0.046	0.018	-0.018
	(0.038)	(0.033)	(0.064)	(0.076)	(0.067)	(0.053)	(0.043)	(0.052)	(0.056)
Age of HH Head	0.000***	0.000***	-0.001***	-0.001***	-0.000	0.001***	0.000*	0.000	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of Hh head= Female	0.027***	0.013**	0.014	-0.004	-0.008	0.009	0.027***	-0.014	-0.004
(Base = Male)	(0.007)	(0.006)	(0.012)	(0.013)	(0.012)	(0.009)	(0.007)	(0.009)	(0.010)
Women Education	0.012***	-0.003***	-0.019***	-0.016***	-0.006***	0.030***	0.010***	0.022***	0.026***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Rural	-0.133***	0.017***	0.041***	0.032***	0.003	-0.089***	-0.052***	-0.031***	-0.059***
(Base=urban)	(0.004)	(0.004)	(0.008)	(0.009)	(0.008)	(0.006)	(0.005)	(0.006)	(0.006)
Household Size	0.000	-0.006***	-0.002**	-0.000	-0.002**	-0.000	0.002***	0.001	0.001
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Religion of the HH (Muslim)	-0.046***	0.000	0.005	0.003	0.004	-0.014**	-0.014**	-0.056***	-0.094***
(Base= Hindu)	(0.005)	(0.004)	(0.009)	(0.010)	(0.009)	(0.007)	(0.006)	(0.007)	(0.007)
Religion of the HH (Christian)	-0.035**	-0.002	-0.052*	-0.070**	-0.012	0.015	-0.021	0.005	0.008
	(0.017)	(0.015)	(0.029)	(0.035)	(0.031)	(0.024)	(0.019)	(0.023)	(0.025)
Religion of the HH (Sikh)	0.020	-0.015	-0.060	-0.129***	-0.034	0.075**	0.031	0.082**	0.066*
	(0.025)	(0.022)	(0.043)	(0.045)	(0.040)	(0.035)	(0.028)	(0.034)	(0.036)
Religion of the HH (Others)	0.059***	-0.001	-0.009	-0.008	0.005	0.045***	0.034**	0.048***	0.050***
	(0.012)	(0.011)	(0.022)	(0.023)	(0.020)	(0.017)	(0.014)	(0.017)	(0.018)

Table 4. 43 (cont'd)

Caste of the household(SC)	-0.042***	0.004	0.043***	0.035***	0.051***	-0.121***	-0.036***	-0.076***	-0.100***
(Base= General Caste)	(0.005)	(0.005)	(0.009)	(0.011)	(0.010)	(0.008)	(0.006)	(0.007)	(0.008)
Caste of the household(ST)	-0.009**	0.013***	0.017**	0.028***	0.013*	-0.020***	-0.012**	-0.029***	-0.041***
	(0.004)	(0.004)	(0.007)	(0.008)	(0.007)	(0.006)	(0.005)	(0.006)	(0.006)
Constant	0.123***	0.079***	0.554***	0.723***	0.199***	0.704***	0.147***	0.359***	0.598***
	(0.031)	(0.027)	(0.052)	(0.055)	(0.049)	(0.043)	(0.035)	(0.042)	(0.045)
Observations	45,285	44,051	35,896	28,145	27,695	45,285	45,285	45,285	45,285
R-squared	0.145	0.024	0.071	0.070	0.046	0.247	0.130	0.158	0.213

Note: * *p*<0.1; ** *p*<0.05; *** *p*<0.01. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

Table 4. 44: TESTING PARALLEL TREND - PARENT STATE AS COMPARISON AND NEWLY FORMED STATES AS TREATMENT

VARIABLES	(1) HHH Education	(2) Electricity	(3) Piped Drinking Water	(4) Concrete house	(5) Toilet	(6) Clean Cooking Fuel	(7) Television	(8) Refrigerator	(9) Motorcycle
Districts in New states X Post	-0.407	-0.028	0.010	-0.005	-0.045	-0.048**	-0.021*	-0.009	-0.011
	(0.322)	(0.112)	(0.012)	(0.010)	(0.039)	(0.018)	(0.012)	(0.009)	(0.010)
Dummy Post	0.147*	0.052***	-0.001*	0.043***	0.036***	0.072***	0.082***	0.010***	0.006*
	(0.082)	(0.004)	(0.001)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)
Dummy Treatment	-0.037	-0.038	0.054***	-0.12***	-0.20***	-0.061**	-0.081**	-0.087***	-0.014
	(0.776)	(0.042)	(0.006)	(0.035)	(0.033)	(0.027)	(0.041)	(0.033)	(0.033)
Age of head of household	-0.053***	0.001***	0.000*	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of HH head- Female	-3.298***	0.022***	-0.001	0.025***	0.026***	0.010**	0.017**	-0.000	0.009
(Base = Male)	(0.133)	(0.007)	(0.001)	(0.006)	(0.006)	(0.005)	(0.007)	(0.006)	(0.006)
Education of the HH head		0.008***	-0.000	0.008***	0.008***	0.007***	0.009***	0.005***	0.006***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household Size	0.055***	0.009***	0.000	0.003***	0.003***	-0.003***	0.012***	0.000	0.006***
	(0.010)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Rural	-3.998***	-0.462***	0.003***	-0.473***	-0.569***	-0.384***	-0.406***	-0.180***	-0.156***
(Base=urban)	(0.098)	(0.005)	(0.001)	(0.004)	(0.004)	(0.003)	(0.005)	(0.004)	(0.004)
Religion of the HH (Muslim)	-2.148***	-0.005	-0.002*	-0.038***	0.096***	-0.059***	-0.078***	-0.024***	-0.047***
(Base= Hindu)	(0.111)	(0.006)	(0.001)	(0.005)	(0.005)	(0.004)	(0.006)	(0.005)	(0.005)
Religion of the HH (Christian)	2.038***	0.003	-0.004	0.066***	0.094***	0.073***	0.064***	0.047**	0.087***
	(0.461)	(0.025)	(0.003)	(0.021)	(0.019)	(0.016)	(0.025)	(0.020)	(0.020)
Religion of the HH (Sikh)	0.495	0.197***	-0.005	0.153***	0.092***	0.219***	0.200***	0.208***	0.189***
	(0.579)	(0.031)	(0.004)	(0.026)	(0.024)	(0.020)	(0.031)	(0.025)	(0.025)
Religion of the HH (Others)	1.898***	0.049**	0.004	0.068***	0.077***	0.185***	0.173***	0.169***	0.168***
	(0.399)	(0.021)	(0.003)	(0.018)	(0.017)	(0.014)	(0.021)	(0.017)	(0.017)
Caste of the household(SC)	-2.023***	-0.067***	-0.00***	-0.07***	-0.07***	-0.06***	-0.086***	-0.031***	-0.050***
(Base= General Caste)	(0.104)	(0.006)	(0.001)	(0.005)	(0.004)	(0.004)	(0.006)	(0.004)	(0.005)

Table 4. 44 (cont'd)

Caste of the household(ST)	-2.131***	-0.072***	0.003***	-0.07***	-0.07***	-0.04***	-0.077***	-0.022***	-0.040***
	(0.114)	(0.006)	(0.001)	(0.005)	(0.005)	(0.004)	(0.006)	(0.005)	(0.005)
Constant	11.983***	0.685***	-0.002	0.672***	0.753***	0.422***	0.434***	0.223***	0.081***
	(0.467)	(0.025)	(0.004)	(0.021)	(0.020)	(0.016)	(0.025)	(0.020)	(0.020)
Observations	41,435	41,435	41,435	41,435	41,435	41,118	41,435	41,433	41,428
R-squared	0.117	0.416	0.105	0.377	0.501	0.413	0.299	0.117	0.133

Note: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

Table 4. 45: TESTING PARALLEL TREND (HEALTH INDICATORS)- PARENT STATE AS COMPARISON AND NEWLY FORMED STATES AS TREATMENT

VARIABLES	(1) Govt Institutional Delivery	(2) Infant Death	(3) Under-weight	(4) Stunted	(5) Wasted	(6) Tetanus Shot	(7) Polio Vaccine	(8) Measles Vaccine	(9) BCG Vaccine
Districts in New states X Post Dummy	-0.005	0.000	0.021	0.012	0.120	0.006	-0.039	-0.070*	0.061
	(0.013)	(0.015)	(0.029)	(0.050)	(0.146)	(0.024)	(0.037)	(0.040)	(0.054)
Post Dummy	-0.005	0.003	-0.032***	-0.018	-0.028***	0.181***	-0.144***	0.008	0.045***
	(0.004)	(0.005)	(0.010)	(0.011)	(0.011)	(0.008)	(0.006)	(0.007)	(0.008)
Treatment	-0.145***	0.020	0.227**	0.183*	0.066	-0.427***	-0.056	-0.212***	-0.201**
	(0.045)	(0.053)	(0.098)	(0.100)	(0.092)	(0.082)	(0.057)	(0.067)	(0.082)
Age of head of household	0.000***	0.000	-0.001***	-0.001***	-0.000	0.001***	0.000***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of head of household female	0.022***	0.010	-0.020	0.005	-0.032*	-0.006	0.018*	-0.018	0.004
(Base = Male)	(0.008)	(0.010)	(0.018)	(0.019)	(0.017)	(0.015)	(0.010)	(0.012)	(0.015)
Women Education	0.015***	-0.003***	-0.016***	-0.014***	-0.005***	0.036***	0.012***	0.025***	0.031***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Rural	-0.112***	0.030***	0.058***	0.036***	0.013	-0.158***	-0.056***	-0.070***	-0.094***
(Base=urban)	(0.006)	(0.007)	(0.013)	(0.014)	(0.013)	(0.010)	(0.007)	(0.008)	(0.010)
Household Size	0.000	-0.005***	-0.001	-0.001	-0.002**	-0.000	0.002***	0.001*	0.001
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Religion of the HH (Muslim)	-0.020***	0.004	-0.000	0.000	0.017	-0.029***	-0.024***	-0.049***	-0.106***
(Base= Hindu)	(0.005)	(0.006)	(0.012)	(0.012)	(0.011)	(0.010)	(0.007)	(0.008)	(0.010)
Religion of the HH (Christian)	-0.017	0.007	-0.013	-0.046	-0.075	0.081	0.019	0.087**	0.136***
	(0.028)	(0.033)	(0.064)	(0.070)	(0.065)	(0.052)	(0.036)	(0.043)	(0.052)
Religion of the HH (Sikh)	0.103***	0.030	-0.144*	-0.326***	-0.068	0.109	0.046	0.107*	0.076
	(0.038)	(0.045)	(0.086)	(0.089)	(0.081)	(0.070)	(0.049)	(0.058)	(0.070)
Religion of the HH (Others)	0.010	0.009	0.056	-0.024	0.047	0.084**	0.121***	0.092***	0.142***
	(0.021)	(0.024)	(0.046)	(0.053)	(0.049)	(0.039)	(0.027)	(0.032)	(0.038)

Table 4. 45 (cont'd)

Caste of the household(SC)	-0.041***	0.007	0.036**	0.047**	0.044**	-0.148***	-0.038***	-0.080***	-0.096***
(Base= General Caste)	(0.007)	(0.008)	(0.015)	(0.019)	(0.018)	(0.013)	(0.009)	(0.010)	(0.013)
Caste of the household(ST)	-0.019***	0.012**	0.008	0.023**	0.012	-0.025***	-0.011*	-0.025***	-0.045***
	(0.005)	(0.005)	(0.010)	(0.011)	(0.010)	(0.008)	(0.006)	(0.007)	(0.008)
Constant	0.279***	0.072**	0.379***	0.625***	0.124**	0.714***	0.191***	0.394***	0.574***
	(0.025)	(0.029)	(0.052)	(0.058)	(0.053)	(0.046)	(0.032)	(0.037)	(0.045)
Observations	22,166	21,261	17,163	14,133	13,872	22,166	22,166	22,166	22,166
R-squared	0.127	0.023	0.050	0.054	0.039	0.191	0.104	0.125	0.157

Note: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

Table 4. 46: TESTING PARALLEL TREND - RDD USING DISTRICTS ON THE NEWLY FORMED STATES AS TREATMENT AND PARENT STATE AS COMPARISON

VARIABLES	(1) HHH Education	(2) Electricity	(3) Piped Drinking Water	(4) Concrete house	(5) Toilet	(6) Clean Cooking Fuel	(7) Television	(8) Refrigerator	(9) Motorcycle
New State Border Dist. # Dummy Post	-0.186	0.023	0.026	-0.001	-0.086	-0.052*	-0.008	-0.021	-0.006
	(0.331)	(0.018)	(0.023)	(0.014)	(0.074)	(0.031)	(0.017)	(0.015)	(0.016)
Dummy Post	-0.267	-0.020*	0.001	0.010	0.061***	0.062***	0.050***	0.016*	-0.012
	(0.202)	(0.011)	(0.002)	(0.009)	(0.008)	(0.007)	(0.011)	(0.009)	(0.009)
Dummy Treatment	-1.013	0.265***	0.095***	-0.000	0.095***	0.081***	0.155***	0.046	0.071**
	(0.766)	(0.041)	(0.007)	(0.033)	(0.032)	(0.025)	(0.040)	(0.035)	(0.036)
Age of head of household	-0.055***	0.002***	0.000*	0.002***	0.002***	0.001***	0.001***	0.001***	0.000**
	(0.005)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of HH Head= female	-3.212***	0.038**	-0.006**	0.046***	0.036***	0.012	0.035**	0.005	0.007
(Base = Male)	(0.282)	(0.015)	(0.003)	(0.012)	(0.012)	(0.009)	(0.015)	(0.013)	(0.013)
Education of the HH head		0.010***	-0.000	0.009***	0.009***	0.006***	0.010***	0.004***	0.006***
		(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Household Size	0.072***	0.009***	-0.000	0.002**	0.002**	-0.005***	0.011***	0.001	0.007***
	(0.022)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Rural	-4.209***	-0.486***	0.003	-0.450***	-0.547***	-0.339***	-0.367***	-0.179***	-0.145***
(Base=urban)	(0.193)	(0.010)	(0.002)	(0.009)	(0.008)	(0.006)	(0.010)	(0.009)	(0.009)
Religion of the HH (Muslim)	-2.512***	-0.031**	-0.003	-0.052***	0.110***	-0.074***	-0.128***	-0.033***	-0.049***
(Base= Hindu)	(0.241)	(0.013)	(0.002)	(0.011)	(0.010)	(0.008)	(0.013)	(0.011)	(0.011)
Religion of the HH (Christian)	0.931	0.066	0.007	0.086**	0.150***	0.111***	0.096**	0.026	0.134***
	(0.894)	(0.048)	(0.009)	(0.039)	(0.037)	(0.029)	(0.047)	(0.040)	(0.042)
Religion of the HH (Sikh)	0.995	0.126***	-0.007	0.147***	0.063*	0.225***	0.207***	0.263***	0.203***
	(0.839)	(0.045)	(0.008)	(0.036)	(0.035)	(0.027)	(0.044)	(0.038)	(0.039)
Religion of the HH (Others)	0.593	0.038	0.003	-0.021	-0.041	0.101***	0.024	0.041	0.014
	(0.675)	(0.036)	(0.006)	(0.029)	(0.028)	(0.022)	(0.035)	(0.031)	(0.032)
Caste of the household(SC)	-1.662***	-0.072***	-0.009***	-0.082***	-0.075***	-0.053***	-0.082***	-0.037***	-0.059***

Table 4. 46 (cont'd)

(Base= General Caste)	(0.203)	(0.011)	(0.002)	(0.009)	(0.008)	(0.007)	(0.011)	(0.009)	(0.010)
Caste of the household(ST)	-1.798***	-0.053***	0.011***	-0.070***	-0.076***	-0.047***	-0.101***	-0.036***	-0.055***
	(0.223)	(0.012)	(0.002)	(0.010)	(0.009)	(0.007)	(0.012)	(0.010)	(0.011)
Constant	12.054***	0.396***	-0.004	0.406***	0.405***	0.283***	0.195***	0.116***	0.099***
	(0.736)	(0.040)	(0.007)	(0.032)	(0.031)	(0.024)	(0.039)	(0.034)	(0.035)
Observations	10,361	10,361	10,361	10,361	10,361	10,312	10,361	10,361	10,360
R-squared	0.118	0.367	0.121	0.405	0.486	0.400	0.282	0.106	0.099

Note: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

Table 4. 47: TESTING PARALLEL TREND (HEALTH INDICATORS)- RDD USING DISTRICTS ON THE NEWLY FORMED STATES AS TREATMENT AND PARENT STATE AS COMPARISON

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	Govt Institutional Delivery	Infant Death	Under-weight	Stunted	Wasted	Tetanus Shot	Polio Vaccine	Measles Vaccine	BCG Vaccine
Treatment x Dummy Post	-0.001	-0.002	0.134	0.029	0.114	-0.016	0.003	-0.083**	0.055*
	(0.016)	(0.021)	(0.140)	(0.051)	(0.149)	(0.033)	(0.024)	(0.027)	(0.033)
Dummy Post	-0.014	0.005	-0.061**	-0.029	-0.022	0.241***	-0.145***	0.022	0.066***
	(0.010)	(0.013)	(0.025)	(0.026)	(0.025)	(0.019)	(0.014)	(0.016)	(0.019)
Treatment RDD	0.059*	-0.004	-0.191**	-0.080	-0.170*	-0.013	0.035	0.187***	0.255***
	(0.033)	(0.042)	(0.081)	(0.094)	(0.091)	(0.067)	(0.048)	(0.055)	(0.066)
Age of HH Head	0.000	-0.000	-0.000	-0.001	0.000	0.001**	0.000	0.001	0.001**
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of HH head= female	0.035**	-0.008	-0.044	0.023	-0.016	0.065**	-0.005	0.011	0.077**
(Base = Male)	(0.015)	(0.019)	(0.036)	(0.036)	(0.034)	(0.030)	(0.022)	(0.025)	(0.030)
Women Education	0.011***	-0.00***	-0.01***	-0.01***	-0.002	0.039***	0.013***	0.023***	0.031***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)
Rural	-0.076***	0.020*	0.074***	0.043*	0.045**	-0.15***	-0.06***	-0.05***	-0.03***
(Base=urban)	(0.009)	(0.011)	(0.023)	(0.022)	(0.021)	(0.018)	(0.013)	(0.015)	(0.018)
Household Size	-0.002**	-0.00***	-0.002	0.001	-0.003	-0.002	0.002**	0.003**	0.004**
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)
Religion of the HH (Muslim)	-0.033***	-0.015	0.092***	0.034	0.049**	-0.040**	-0.04***	-0.07***	-0.11***
(Base= Hindu)	(0.010)	(0.012)	(0.025)	(0.024)	(0.023)	(0.020)	(0.014)	(0.016)	(0.020)
Religion of the HH (Christian)	0.025	0.036	-0.100	0.026	-0.143	0.026	-0.012	0.024	0.230***
	(0.043)	(0.056)	(0.116)	(0.110)	(0.109)	(0.087)	(0.062)	(0.071)	(0.086)

Table 4. 47 (cont'd)

Religion of the HH (Sikh)	0.154***	0.074	-0.281**	-0.36***	-0.110	0.104	0.196***	0.205**	0.158
	(0.050)	(0.062)	(0.128)	(0.120)	(0.114)	(0.101)	(0.072)	(0.082)	(0.100)
Religion of the HH (Others)	-0.060**	0.084**	0.237***	0.011	0.164**	0.103*	0.112***	0.116***	0.189***
	(0.027)	(0.033)	(0.072)	(0.072)	(0.070)	(0.055)	(0.039)	(0.045)	(0.054)
Caste of the household(SC)	-0.038***	-0.002	0.046*	0.054*	0.047	-0.12***	-0.05***	-0.10***	-0.1***
(Base= General Caste)	(0.011)	(0.013)	(0.026)	(0.030)	(0.029)	(0.021)	(0.015)	(0.017)	(0.021)
Caste of the household(ST)	-0.007	0.015	-0.003	0.012	0.013	-0.036**	-0.003	0.000	-0.022
	(0.009)	(0.011)	(0.022)	(0.021)	(0.021)	(0.018)	(0.012)	(0.014)	(0.017)
Constant	0.091***	0.116***	0.671***	0.663***	0.488***	0.509***	0.184***	0.076	0.155**
	(0.031)	(0.039)	(0.077)	(0.074)	(0.071)	(0.063)	(0.045)	(0.051)	(0.062)
Observations	5,271	5,096	4,043	3,542	3,471	5,271	5,271	5,271	5,271
R-squared	0.097	0.024	0.069	0.075	0.052	0.221	0.109	0.143	0.172

Note: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. Standard errors are in parentheses. All regressions have district fixed effect and standard errors are clustered at the village level

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