Dowry Deaths: Response to Weather Variability in India☆

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Abstract

We examine the effect of rainfall shocks on dowry deaths using data from 583 Indian districts for 2002-2007. We find that a one standard deviation decline in annual rainfall from the local mean increases reported dowry deaths by 7.8 percent. Wet shocks have no apparent effect. We examine patterns of other crimes to investigate whether an increase in general unrest during economic downturns explains the results but do not find supportive evidence. Women's political representation in the national parliament has no apparent mitigating effect on dowry deaths.

Keywords: Crime, Dowry Deaths, Consumption Smoothing, Weather Shocks, Climate, India

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1. Introduction

Gender inequality is particularly salient in South Asia. Women generally have limited power in household decision making and are often discriminated against in nutrition and

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education (Sen 1992; Pande 2003). As in many other countries, in India women also fall victim to violent crime at high rates.[1] In this paper, we examine how rainfall variability affects dowry deaths in India.[2] We also examine whether political representation of women reduces these crimes.

Specifically, we estimate how dowry deaths in individual Indian districts respond to plausibly exogenous local precipitation shocks in a given year. Using the conditional maximum likelihood (also called Quasi-Maximum Likelihood, or QML) estimation method proposed by Hausman et al. (1984) to estimate fixed effects models with count data, we find that a 1 standard deviation fluctuation of rainfall below its long-term mean results in a 7.8 percent increase in dowry deaths and a 4.4 percent increase in domestic violence, controlling for district and year fixed effects. These findings are robust to the inclusion of district-specific time trends and the exclusion of big cities and potential outliers.

We posit that a consumption smoothing mechanism drives these findings, and we present evidence that supports this hypothesis. First, using a dataset collected from a subset of the districts, we show that dowry payments increase in response to adverse rainfall shocks. Second, we show that the incidence of dowry killings in response to shocks is much lower in areas where dowry would be be less prevalent due to differences in cultural norms. We also show that shocks in agriculturally important periods of rain drive our results.

Our study makes contributions to four strands of literature. First, we advance the understanding of social costs of expected changes in weather patterns in India. Rainfall is expected to become more variable in South Asia from year to year, potentially making droughts and floods more common (Challinor et al. 2006; Christensen et al. 2007). Our study sheds light on indirect social costs—in terms of crimes against women—of increased variability of rainfall.[3] In doing so, our analysis separately identifies the impacts of dry

[1]As of 1993, rape and domestic violence constituted 5 percent of the disease burden among women aged 15 to 44 in the developing world (World Bank, 1993). Karlekar (1998) and Jahan (1991) provide surveys on domestic violence for India and Bangladesh, respectively. A recent article posits that women in India are three times as likely to die from a fire as men (Sanghavi, Bhalla, and Das, 2009).

[2]Dowry deaths are killings of married women for bringing insufficient dowry. We provide the legal definition in Section 2.

[3]Many recent economics papers have estimated costs of climate change in developed countries, in

and wet shocks (i.e., rainfall below and above the local mean, respectively). Rose (1999) shows that extreme weather events lead to excess female mortality in India. Our study illustrates that these events are associated with an increase in dowry killings of women.

The paper most closely related to ours is Miguel (2005), which evaluates the effects of weather-related income shocks in Tanzania, and finds that extreme rainfall leads to an increase in religiously motivated murders of elderly women. Our paper is different in several important respects. Miguel (2005) proposes a different mechanism for such killings. The study explores whether households near subsistence kill relatively unproductive elderly household members to protect the nutritional status of other members by decreasing overall consumption needs.[4] On the other hand, our study posits that dowry killings are at least partially driven by incentives to smooth consumption. We present suggestive evidence that dowry deaths are used to increase income in time of economic distress, as these killings give households access to a large dowry payment. We show that dowry payments in a limited sample increase in response to weather-induced shocks. Second, Miguel (2005) focuses on a very small sample in a small region. Our paper's findings are based on data from an entire very large country that contains several agro-climatic zones. Third, we are able to compare multiple crime categories. Finally, unlike the prior study, we also examine a potential mitigation strategy. A detailed discussion of this strategy is presented later.

Our paper also contributes to the literature on consumption smoothing.[5] Our results provide suggestive evidence that at least part of the appropriation risk faced by women arises from economic incentives to smooth consumption, rather than having purely religious or social roots. Previous research has shown that in order to smooth consumption in response to negative weather shocks, rural households resort to a variety of strategies, including supplying additional labor hours (Kochar 1999; Rose 2001), reducing human

terms of its effects on agriculture, health, and social unrest (Dell et al. 2009; Deschenes and Greenstone 2007; Deschenes and Moretti 2009; Mendelsohn et al. 1994). In developing countries, recent work has focused on agriculture and mortality (Guiteras 2008; Burgess et al. 2008; Kudamatsu et al. 2009; Burgess and Donaldson 2010; Miguel et al. 2004), and more recently on crimes (Blakeslee and Fishman, 2013).

[4] This extreme scarcity theory is developed in DasGupta and Ray (1986).

[5] Dercon (2002) and Morduch (1995) survey this literature.

capital investment in children (Jensen, 2000), marrying daughters to distant households (Rosenzweig and Stark, 1989), and selling productive assets (Rosenzweig and Wolpin, 1993). Our findings are consistent with the hypothesis that dowry killings are an additional consumption smoothing mechanism.

We also contribute to the literature on crimes against women. Several studies, both in developed and developing countries, have analyzed the effect of women's empowerment on domestic violence. An improvement in womens relative earning potential or position can increase her bargaining power and reduce domestic violence aimed at her. But it can also increase domestic violence due to "backlash" by men who retaliate when women's relative income in the household increases. Empirical evidence is mixed. While in the United States a relative increase in women's earnings has been demonstrated to reduce domestic violence against women (Aizer, 2010), in India this been shown to increase marital violence (Luke and Munshi, 2011). Using the timing of the introduction of laws that mandate arrests in domestic violence cases across states in United States, Iyengar (2009) also shows evidence consistent with backlash. Mandated political representation in local governance councils has been shown to increase reporting of crimes against women in India (Iyer et al., 2012). Our work complements this literature, illustrating that precipitation shocks increase the incidence of dowry related killings of women in India and that political representation of women in national parliament does not mitigate this risk.

Finally, we extend the literature linking poverty and criminal behavior. Research using historical data has shown that poverty affected criminal behavior in Germany and France (Mehlum et al. 2006; Bignon and Galbiati 2011). Using Brazilian data, Hidalgo and Richardson (2010) examine the effect of negative shocks on redistributive conflict showing that economic adversity leads to land invasions by the poor. Commodity price shocks have been demonstrated to increase armed civil conflict in Colombia (Dube and Vargas, 2013) and negative rainfall shocks have been shown to increase insurgent violence against civilians and armed forces in India (Eynde, 2011). Our study shows that negative rainfall shocks increase reported domestic violence and dowry deaths in India.

An important limitation of our work is that we observe reported crimes, which are the product of two events: occurrence and reporting. Drèze and Khera (2000) point out that murders are very difficult to hide. Furthermore, as described below, Indian law mandates post-mortem examinations in the deaths of young women under a broad set of circumstances, further reducing the likelihood of underreporting. In addition, dowry deaths are reported by the family or friends of the deceased women, who are less likely to be influenced by social norms and fear of retaliation than the women. However, we cannot rule out that reporting is also responding to shocks. If dowry deaths are generally underreported, then our estimates are lower bounds of the true effects. On the hand, if shocks lead to overreporting—for example, if families report dowry deaths in adverse circumstances to extract a compensation for withdrawing the case—then we would see an upward bias in our results. Using aggregate statistics, we show that the percentage of case withdrawals is extremely small and cannot be driving our results. We also show that incidence of dowry deaths is lower in districts where dowry prevalence is likely to be lower. This further suggests that our results cannot be driven by reporting changes alone.

Our findings have important policy implications. Policies aimed at allaying the effects of weather shocks will need to consider elevated risks faced by vulnerable segments of the population. In this paper, we also evaluate one potential mitigation strategy. We examine whether political representation of women in the National Parliament mitigates these risks and do not find evidence for such mitigation. The Indian government is considering reserving 33 percent of seats in the Parliament for women, with the objective of promoting equity and protecting the interests of all women in the country. Our results suggest that increased representation may not help reduce crimes such as dowry deaths in the face of economic adversity.

The remainder of the paper is organized as follows. Section 2 provides contextual information on dowry deaths and domestic violence in India, and a simple framework. Section 3 describes the data used in our empirical work. Section 4 presents our empirical strategy. The main empirical results, robustness checks, and additional evidence supporting our mechanism are presented in Section 5. Heterogeneity in the results is explored in Section 6 and a possible mitigation strategy in Section 7. Section 8 provides concluding remarks.

2. Background

In this section, we provide background information on the social, economic, and legal context pertaining to dowry deaths. Then we present a simple framework which describes the potential mechanism.

2.1. Social, Economic, and Legal Context

In India, violence related to dowry surfaces after marriage, when the initial dowry, paid at the time of the wedding, is already in the hands of the husband and his family. The husband and his family demand additional payments, and the husband systematically abuses the wife in order to extract larger transfers. Social stigma associated with divorce prevents women from exiting the marriage even when they are abused.[6] Some have argued that parents may prefer violence against their daughters over the dishonor that divorce brings (Musa 2012). Bloch and Rao (2002) develop a framework in which marital violence is used to extract dowry transfers from the wife's family. Their empirical findings provide strong evidence that domestic violence in India is an economically motivated crime.[7]

In extreme cases, these dowry disputes escalate to murders. When a wife dies, her husband becomes free to remarry and receive dowry from a new wife's family (Mullatti 1995; Johnson and Johnson 2001). As Jutla and Heimbach (2004) describe the situation, "the husband and/or in-laws have determined that the dowry, a gift given from the daughter's parents to the husband, was inadequate and therefore attempt to murder the new bride to make the husband available to remarry or to punish the bride and her family." Men alleged or suspected of murdering their wives potentially find it difficult to remarry. However, in rural South Asia, men tend to marry women from faraway villages and limited local information may flow across areas. Because families are often complicit

[6] In the 2005-06 National Fertility and Health Survey (NFHS 3) 1.4 percent of ever-married Indian women age 15-49 were divorced, separated or deserted, with only 0.3 percent divorced.

[7] Economic roots of domestic violence are also documented in Panda and Agarwal (2005).

in the murder, a man can use his kinship network to distort facts about the abuse of his wife, or even conceal the existence of the previous marriage (Musa 2012; Umar 1998; Garg 1990).[8] Musa (2012) argues that limited information is an important factor. "Currently, the Indian government does not publish a list of men whose wives suffered dowry-related death. However, such a list may be one of the most effective deterrence tools available to the government. As family honor is of great importance to Indian families, the threat of a tainted family honor serves as a great disincentive." Although some families currently marry their daughters to men suspected of dowry death, if the men's names were on the list, associating with such men might become less socially favorable.

Remarriage can be compatible with a husband's incentives. Not only will it bring a large one-time dowry payment when the husband is facing economic hardship, it will also replace the periodic payments that were being received from the deceased wife's natal family. The remarriage can be immediate if the husband is not arrested. It is possible that these escalations are unplanned outbursts due to psychological stress, perhaps induced by economic hardship, and are not for economic gain per se, as is the case with domestic violence in Card and Dahl (2011). However, a very extensive sociological and anthropological literature suggests that bride burning, which is the most common form of dowry death, requires meticulous planning (Oldenburg, 2002).

According to a 1986 law, the legal definition of a dowry death is the death of a woman, within seven years of her marriage, caused by any burns or other bodily injury that do not occur under normal circumstances.[9] For a woman's death to be ruled a dowry death, it must also be shown that soon before her death she was subjected to cruelty or harassment by her husband or any relative of her husband for, or in connection with, any demand for dowry. The party found guilty can receive a sentence of seven years to life. Typically, court cases last several years, and in recent years, the conviction rate is roughly one third. Domestic violence is punishable by a sentence of at most three years or a fine. Although domestic violence and dowry deaths may be complementary and

[8] Aggregate statistics on case disposals from 2009 indicate that 21 percent of the arrests for dowry deaths were women and women from all age groups were arrested, suggesting that families may aid dowry killings.

[9] This definition is as per The Dowry Prohibition (Amendment) Act, 1986.

happen together, dowry deaths are a separate crime category.

2.2. Income Risk and Gains from Appropriation

A simple framework can explain how income shocks might increase economically motivated crimes against women. In this framework, an individual deriving his livelihood from agriculture can spend his time on productive labor, leisure, or appropriation. Productive labor is spent producing the consumption good (for example, working on a farm), while appropriation time is spent on coercive activities to appropriate consumption goods from others (for example, harassing his wife to pressure her parents to provide more dowry). Both productive labor and appropriation yield the consumption good. However, the returns to productive labor are stochastic, depending on uncertain weather shocks.

In the event of a bad shock (so that the returns to productive labor decline),[10] for a range of values of the elasticity of substitution between the consumption good and leisure, the time spent on appropriation increases, and the time spent on leisure falls. In the absence of appropriation, a negative shock to the productive sector would have two effects. Loss of income makes the farmer increase the hours spent in the productive sector. On the other hand, the low returns in the productive sector make him substitute away toward leisure. The overall change in productive hours depends on whether the income effect dominates the substitution effect or not. In this framework, however, the farmer can increase his consumption by appropriating from others. Therefore, he will spend more time appropriating if the return to the productive sector falls. In our empirical setting, one of the appropriation activities is to engage in domestic violence to seek dowry. In severe shocks, husbands or their families may even resort to dowry killings so that the husband can enter the marriage market and get another dowry.

Because women tend to marry outside their natal village, their natal families are unlikely to face the same weather shocks that the in-laws do. But even for the women whose natal family resides in the same village and thus experiences the same shocks, we can expect an increase in domestic violence and dowry deaths as long as the husband's

[10]Droughts lead to significant reduction in farm profits in India (Rosenzweig and Binswanger, 1993).

outside option is to enter the marriage market again. The natal family may have to resort to selling assets, depleting savings, or taking loans in order to meet dowry needs in case they experience the same shocks.

3. Data

Our sample consists of 583 districts of India as defined by their 2001 boundaries.[11] Crime data for 2002–2007 come from the National Crime Records Bureau (NCRB), Ministry of Home Affairs. The NCRB maintains records of all reported cognizable crimes in the country.[12] The records provide the number of reported crimes against women by district, year, and category of crime.[13] Unfortunately, they do not distinguish between urban and rural areas within districts. Our empirical analysis focuses on dowry deaths, and domestic violence. We also examine murder, robbery, burglary, riots, and kidnapping, though we do not know the sex of the victims of these crimes.

District average annual rainfall values for the years 2002–2007 were calculated from grids generated by Xie et al. (2002). These data combine information from land-based weather stations with satellite imagery, to improve local accuracy and decrease spurious spatial autocorrelation. Values are available for 0.1 degree grid cells (approximately 115 square kilometers on average). Long-run (1971–2000) mean rainfall, interpolated from station data alone to 0.5 degree grid cells (approximately 2,880 square kilometers), is from the data set CRU TS 2.1, available from the Climate Research Unit, University of East Anglia (Mitchell and Jones, 2005).[14] In the robustness checks, we employ a third data set, also with 0.5 degree resolution, because of its longer temporal coverage

[11] Districts that split between 2001 and 2007 were consolidated into their parent 2001 districts.

[12] Cognizable crimes are the crimes for which the police have a direct responsibility to act upon receipt of a complaint, whereas the non-cognizable crimes require the authorization of a magistrate for the police to take any action (National Crime Records Bureau, 2007).

[13] Most of the crimes we focus on are covered under the Indian Penal Code. While we focus on cognizable crimes, which have the same classification all over India, there is another category of crimes covered under the Special and Local Laws (SLL). The SLL are aimed at controlling other social practices prohibited by various laws over the years. They include the Dowry Prevention Act of 1961 and the Child Marriage Restraint Act of 1929. We do not have data on the crimes covered under SLL. We only examine cognizable crimes.

[14] Both are available from the International Research Institute for Climate and Society, Columbia University, http://iri.columbia.edu.

(Willmott and Matsuura, 2009).[15] We prefer to use the Xie et al. (2002) data as it is finer and also raises fewer concerns about the endogenous placement of stations.

District-level economic and demographic data (population density, literacy rate, unemployment rate, percentage of population residing in rural areas, and sex ratio) are taken from the 2001 Census of India. We also use dowry data from the Gender, Marriage and Kinship Survey collected by the National Council for Applied Economic Research in 1993 in 10 districts in two states: Uttar Pradesh and Karnataka. The Statistical Report on the General Election provides the demographic characteristics of candidates who ran in national parliamentary elections in 1999 and 2004. We use the gender of the winning candidates in each parliamentary constituency to construct the number of female members of Parliament in a district.

Table 1 reports summary statistics for the main variables. An average of 12.1 dowry deaths are reported in each district-year, and 523 out of 583 districts saw at least one dowry death during the sample period. For domestic violence, the corresponding numbers are 101 per district-year and 559 out of 583. Reported dowry deaths and domestic violence are increasing over time, faster on average than population, which grew by 1.6 percent per year between the 2001 and 2011 censuses.

4. Empirical Strategy

Figure 1 provides the main motivation for our analysis. Panel (a) plots a local polynomial regression of district level reported dowry deaths on the deviation of rainfall from its long term mean conditional on district fixed effects. Dowry deaths generally respond to rainfall deviations. Panel (b) shows a broadly similar pattern for domestic violence. We estimate the magnitudes and statistical significance of these effects below.

4.1. Estimation

We exploit random year-to-year deviations of rainfall from its long-term local mean as plausibly exogenous measures of local rain shocks. Our outcome variable, the number of crimes, is a count, so we use a Poisson model specified as follows:

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

$$E[Y_{it} \mid X_{it}, R_{it}] = exp(\pi_1 G(R_{it} - \overline{R_i}) + \pi_2 X'_{it} + \theta_i + \kappa_t) \tag{1}$$

Here Y_{it} is the outcome of interest in district i and year t, R_{it} is rainfall, $\overline{R_i}$ is the long-run mean annual rainfall for district i, X_{it} is a set of district-level time-varying controls, and θ_i and κ_t are district and year fixed effects, respectively. G is a function of the deviation of the rainfall from its mean; in most cases, we use a simple linear spline with a fixed knot at zero. This allows us to distinguish between wet shocks and dry shocks, as suggested by Figure 1. Above-normal rainfall can result in flooding, and below-normal rainfall in droughts, depending on the rainfall amount, the institutional capacity, and the topography of the district.

Equation (1) cannot be estimated consistently using ordinary least squares (OLS) because of the incidental parameters problem.[16] To address this issue, we follow Hausman et al. (1984) and transform the model to obtain a multinomial distribution for Y_{it} that takes the form:

$$E[Y_{it}|R_{it}, X_{it}, \widehat{Y_i}] = \frac{exp(\pi_1 G(R_{it} - \overline{R_i}) + \pi_2 X'_{it} + \kappa_t)}{\sum_{\tau=1}^{T} exp(\pi_1 G(R_{it} - \overline{R_i}) + \pi_2 X'_{it} + \kappa_t)} \widehat{Y_i} \tag{2}$$

where $\widehat{Y_i} = \sum_{\tau=1}^{T} Y_{it}$ is the number of crimes in district i over all years in our sample. This transformation removes the district dummies, and the coefficient of interest can then be consistently estimated. We use Quasi-Maximum-Likelihood (QML) to carry out the estimation.[17]

We want to determine the overall effect of the local weather shocks using variation across years within districts. Conditional on district fixed effects, year-to-year deviations of rainfall from the long-term mean are plausibly random and hence, orthogonal to unobserved determinants of crime. The time-invariant unobserved characteristics of the

[16] See Neyman and Scott (1948) for a detailed discussion.

[17] QML has good consistency properties even when the true model is not Poisson (Wooldridge, 2002). An alternate procedure used by Pakes and Griliches (1980) proposes to transform the model so that 1 is added to the number of crimes if the total is 0 and an indicator variable d_{it} is set equal to 1 for each cell that is transformed. The linear model estimated would then be $\ln Y_{it} = \pi_i + \pi_2 \ln G(R_{it} - \overline{R_i}) + d_{it} + \pi_3 X_{it} + \theta_i + \kappa_T + \epsilon_{it}$. Although this is a simple and flexible procedure, the estimates are biased, since d_{it} is endogenous.

districts are purged using district fixed effects. We also control for common shocks experienced by all districts by including year fixed effects. In a robustness test, we include district specific linear trends. Finally, we cluster errors by district.

As shown in Appendix Table A.1 results are qualitatively similar when estimated by OLS and with a negative binomial.[18]

4.2. Misreporting Concerns

Our data, on reported crimes, are governed by two data generating processes. First, actual crimes Y_{it}^* take place. Second, they either get reported or not, with probability P_{it}^*.[19] We do not observe Y_{it}^* or P_{it}^*, but only their product, Y_{it}. In other words, we cannot separately identify the effect of rain shocks on actual crimes and on the probability to report conditional on a crime being committed. In the event that the conditional probability of reporting is unaffected by rainfall, we get unbiased estimates of the effect on Y_{it}^*. However, if the probability to report is affected by the rain shock, our estimates may be biased. If $P_{it}^* = F(R_{it}, X_{it}, \theta_i, \kappa_t)$, the sign and magnitude of $\frac{\delta F}{\delta R_{it}}$ govern the direction and size of the bias. We discuss the implications of this after we present our results.

5. Main Results

5.1. Dowry Deaths

Table 2 provides the results from the quasi-maximum likelihood estimation of equation (2) for reported dowry deaths. In column 1, we find that reported dowry deaths increase in response to dry shocks, with a 1 m/year decrease in rainfall below its long-term mean leading to a 0.317 log point increase in reported dowry deaths. This is equivalent to a 37.3 percent increase. The within-district standard deviation of rainfall is 0.237 meters. Hence, a 1 standard deviation fluctuation of rainfall below its long-term mean

[18] Using spatially correlated errors following Conley (1999) also does not affect our inference. Using a temporal lag of 0 to 2 years and a spatial lag of 100 to 200 km, the standard error never increases above the district-clustered standard error by more than 5 percent. In other words, like our main specifications, the dry shock coefficient is significant at 5 percent. We use the implementation by Hsiang (2010)

[19] Reporting crimes that do not take place is a possibility but the vast anthropological, social, and legal literature in India suggests that this is very rare in this context (e.g. Umar 1998)

results in a 7.8 percent increase in reported dowry deaths. The coefficient on wet shocks is positive but not significant. The coefficients on the two shocks are jointly significant at 1 percent.

The rest of Table 2 adds controls to equation (2) to provide evidence against alternative interpretations. In order to account for differential trends in the outcomes by socio-demographic factors, in column 2 and all further specifications, we include interactions between the year indicators and district-specific literacy rate, employment rate, percentage of population that is Scheduled Caste, and total population, all from the 2001 census. Data for all these variables are available only for 2001, and thus we are only controlling for differential trends based on the initial values of the variables. The coefficients in column 2 are virtually identical to those in column 1.

If extreme local weather shocks cause generalized social unrest, anarchy, and lawlessness, they might increase all crimes, not particularly dowry deaths. In columns 3–5, we see that these patterns are robust to controlling for reported total crimes, crimes against women, and murders, so an increase in reported dowry deaths is not simply a matter of crime generally rising, but rather its own specialized phenomenon. Point estimates decrease slightly but remain highly significant. Column 6 controls for district-specific linear time trends to ensure that our results are not due to a spurious correlation between secular regional drying trends and reported dowry deaths, and column 7 controls for an outlier. [20] The point estimates are again virtually unchanged from column 1. In column 8, we exclude the 37 districts containing India's largest cities to rule out the possibility that high population density, associated with high crime rates, drives our results.

5.2. Other Crimes

In Table 3, we report the results for other crimes, following the specification of Table 2, column 2.

Dry shocks tend to increase reported domestic violence, whereas wet shocks have no impact. A 1 m/year deficit in rainfall leads to a 0.278 log point (or 32 percent) increase

[20]The empirical model with trends does not cluster errors and we do not control for demographic variables interacted with year indicator as controls in the trend specification due to collinearity.

in the incidence of domestic violence. A decrease of 1 standard deviation in rainfall below its long-term mean results in a 4.4 percent increase in incidence of reported domestic violence. In the framework developed by Bloch and Rao (2002), husbands use domestic violence to signal credible threats of harm in order to extract larger transfers from the wife's natal family. In this framework, a negative shock to the income of the household (the husband in particular) induces the husband to increase the frequency of the abuse. Our findings are consistent with this hypothesis.

In column 2, we see that overall reports of crime against women increase, though by less than reported dowry deaths. This effect is significant at 5 percent. A 1 m/year deficit results in a 15 percent increase in reported crimes against women. However, in columns 3–6, there is no effect on total crimes, murder (excluding dowry deaths), robbery, or burglary. There is a positive effect of dry shocks on riots in column 7, and a marginally significant one on kidnapping in column 8, with a 1 m/year decrease in rainfall causing a 0.146 log points (15.7 percent) increase in kidnappings and abductions. These patterns suggest that the increase in reported dowry deaths and domestic violence is not due to a general breakdown of law and order in the district. Out of the crimes that would result in direct financial benefits (burglary, robbery, and kidnapping), we see an increase only in kidnapping. We believe that this is consistent with the idea of appropriating resources from the vulnerable. In this context, kidnapping shares with domestic violence the idea of preying on the vulnerable in order to extract resources from those who care about the victim.

5.3. Implications of Misreporting

As mentioned in several sociological and anthropological studies, many crimes against women are likely underreported. However, it is difficult to hide a crime like the murder of an adult (Drèze and Khera, 2000). A 1983 law made postmortem examinations compulsory in cases in which a woman dies within seven years of marriage. This law has stopped the rapid disposal of bodies after death and consequently made it extremely difficult for such actions to go unnoticed (Nair, 1996). While cultural norms, fear of retaliation, or shame could often discourage women to report crimes committed against them, families and friends of a deceased victim would not have such inhibitions about reporting. Hence, as mentioned before, dowry deaths are somewhat less likely to go unreported due to shame or fear.

But if reporting responds to shocks, our findings could be biased. If bad rainfall shocks reduce the probability to report dowry deaths, our estimated coefficients would be attenuated. This could happen if, for example, the husband or his family succeed in bribing the dead wife's financially desperate family not to report the death or to misclassify it as a natural death. It is also possible that bad shocks lead to an increase in reporting by the family of the deceased wife so they can extort compensation from the husband or his family in return for withdrawing from the legal proceedings. This would bias our estimates upwards. Below, we present evidence on heterogeneity consistent with real effects.

In addition, aggregate statistics from the National Crimes Reporting Bureau also suggest that strategic increase in reporting by relatives might be limited. In 2001, among the 27,969 cases that were ready to go to trial for dowry deaths, only 180 were withdrawn.[21] In 2007, among 31,231 cases that were ready for trial, 81 were withdrawn and 7,596 new cases were either chargesheeted or a final report was submitted. The percentage of cases withdrawn is less than 1 percent of total cases pending trial in all years in the period 2001 to 2012. Insofar as accidental deaths reported as dowry deaths are more likely to be withdrawn for lack of evidence, we view this as suggestive evidence that increases in reported dowry deaths are not based purely on reporting. As previously mentioned, this type of reporting would have to vary substantially across districts to explain our findings. But we cannot completely rule out the possibility that this type of strategic overreporting may be biasing our results.

On the other hand, domestic violence is widely believed to be underreported. If rain shocks reduce reporting further, then our estimates of the effect on domestic violence will be understating the true effect as we observe an increase in the reported crime. If on the other hand, rain shocks increase the likelihood of reporting crimes, then the domestic

[21] In 2001, as many as 6,539 new cases were chargesheeted or a final report was submitted by police and at the end of the year 22,697 trials were pending. These data are not available at the district level.

violence results can be driven entirely by an increase in reporting. We do not think this is likely, but our data does not allow us to rule out this possibility entirely. The fact that economic hardship, proxied by rainfall shocks, has analogous effects on reported domestic violence and dowry deaths lends more credibility to these results.[22]

5.4. Intensity and Timing of Shocks

5.4.1. Intensity of Shocks

It is unlikely that a 1 millimeter deviation is highly detrimental to agriculture, or that the effect of a given deviation is the same in a very dry region as it is in a very wet region. In order to have a more robust reference category, and to test the effects of magnitudes that are more comparable across agroclimatic zones, in Table 4, we consider effects by bins of deviations of rainfall from the long-term mean, normalized by the local standard deviation. We use bins 0.75 standard deviations wide, with the bin centered on the mean as the reference category. The effects on reported dowry deaths reported in column 1 are consistent with those in Table 2, getting larger for each bin drier than the reference. None of the wetter bins have any effect. In columns 2, 3, 4, and 5 of Table 4 we repeat this for robbery, burglary, kidnapping/abduction, and domestic violence. While reported domestic violence and kidnapping/abduction increase in response to drier shocks, burglary and robbery do not. As a sensitivity test, we repeat this exercise with bins 0.50 standard deviations wide and find similar patterns (Appendix Table A.2).[23]

5.4.2. Timing

Next, we explore the timing of rainfall shocks to advance our claim that agricultural income is the channel through which they affect dowry deaths. There are two main rainy seasons in India: the Southwest or Summer Monsoon that covers the period June to September, and the North East or Winter Monsoon from October to December (Reserve Bank of India, 2011). Correspondingly, there are two major sowing seasons: Kharif for

[22]We also examine dowry payments to bolster our hypothesis in Section 5.6. However, the data we have on dowry payments are not very rich and can only provide suggestive evidence.

[23]Using these alternate bins, robbery increases in the driest bins. But the robbery results are only statistically significant at 10 percent and not robust across various specifications.

the summer and Rabi for the winter. The magnitude and timing of the South West Monsoon co-moves with Kharif season agricultural production (Reserve Bank of India, 2011). Figure 2 shows the monthly average long term rainfall for India. June through September are the rainiest months, with almost 75 percent of the annual total.

Table 5 exploits this information to determine whether our effect is being driven by periods of agriculturally important rainfall consistent with our framework. We also show that lags of these measures do not have predictive power for our outcomes. Our dowry deaths data are reported on an annual basis. However, the Willmott and Matsuura (2009) rainfall data are are available for shorter time periods.[24] We calculate wet and dry shocks for four periods—June through September (JJAS), October through December (OND), January through March (JFM), and April and May (AM). In column 1, we find a strong impact of rain in June–September, the critical period for the Kharif crop. Column 2 shows that effects of rain at other times of year are generally smaller and less precisely measured. Column 3 further considers the lagged June–September effect, as well as the lagged October–December effect, which may have effects on the Rabi crop in the following year. Lagged June–September shocks seem to have a statistically significant effect, but we illustrate in column 4 that this is driven by a single outlier. Although the income effects of a deficient South West Monsoon may persist in the following year, plausibly the households start adapting as soon as the shocks are realized. We show in the next subsection that area sown declines in response to dry shocks, consistent with farming households starting to adapt immediately at the time of sowing.[25] Incentives to initiate consumption smoothing activities in anticipation of an economic downturn could be driving the timing but we cannot conclusively test this with our data.

Table 6 shows the results from robustness tests related to the timing of rainfall across years. Column 1 repeats our benchmark specification using the Willmott and Matsuura (2009) rain data, in which we observe 2001 rainfall. The results are very similar. Using

[24]We show subsequently that this rainfall series produces qualitatively similar results to those reported in Table 2. We use this time series as our main time series does not have the 2001 data and we cannot generate lags with it.

[25]Rosenzweig and Binswanger (1993) also provide evidence that households modify production decisions before harvesting after the shocks are realized.

these alternative rain data, in columns 2 and 3 we see that the previous year's rainfall has no effect, whether or not we control for contemporaneous shocks. Following Miguel, Satyanath, and Sergenti (2004), in column 4, we conduct a falsification test, checking for an effect due to future rainfall shocks. We expect these to be orthogonal to the current periods incentives to smooth consumption, and our results are consistent.

5.5. Effects on Area Sown and Agricultural Production

Our proposed mechanism relies on shocks reducing agricultural productivity. We further bolster this mechanism by showing that dry shocks do indeed reduce area sown and total agricultural production. We use district-level production data for all crops collected by India's Directorate of Economic Statistics in the Ministry of Agriculture and examine nonlinear dry and wet shocks based on standard deviations from long term means. Table A.3 shows that dry shocks of small and large magnitude alike affect agricultural outcomes. Both production (column 1) and area sown (column 2) decline in response to dry shocks. Wet shocks of small magnitude do not affect these outcomes. However, large wet shocks (more than 1.875 SD) appear to increase agricultural production on average. Wet shocks are likely to affect agricultural income negatively only in certain circumstances, for example in case of flooding events. In other circumstances, they can actually be beneficial. We expect that this heterogeneity is why we find no overall effects of wet shocks on reported dowry deaths or other crimes in aggregate.[26]

5.6. Dowry Payments

Evidence on dowry payments is also consistent with our hypothesis.[27]

One key strategy to cope with weather shocks is to marry daughters to families far away so that weather shocks at the in-laws location are relatively uncorrelated with those in the natal location (Rosenzweig and Stark, 1989). In such settings, the families

[26] Rosenzweig and Binswanger (1993) use ICRISAT data from India to document that the monsoon onset date influences both agricultural production and income but the effect on income is mitigated because of ex-post adaptation. We do not have direct income data, and hence only show reduced form evidence.

[27] Ideally, we would like to use an annual panel on income to provide direct evidence in support of our claim. But we are not aware of such a panel data for districts of India, so we rely on a cross-section of households in 10 districts in one year for dowry payments.

of the couple can transfer assets voluntarily when they experience adverse shocks, and we would not expect dowry payments to rise. Therefore, we examine what happens to dowry payments in response to shocks separately when the natal family of the wife lives more and less than 20 kilometers away, the median distance in the data.[28]

The results are reported in Appendix Table A.4, showing four different types of assets that make up the dowry payments. The "other assets" category in column 4 includes most prominently cattle and other farm animals.[29] While three of four dry shock coefficients for near families are positive consistent with the hypothesis that dowry payments are used for consumption smoothing, only dowry in the form of other assets is statistically significant. The point estimates of the responses to dry shocks are much larger than those for wet shocks, but the standard errors are larger as well.[30]

6. Heterogeneity: Cultural and Demographic Characteristics

Heterogeneity within our results provides further evidence consistent with the effect being driven by consumption smoothing and remarriage incentives.

Traditionally, dowry is more prevalent among Hindus in India. Srinivasan and Lee (2004) hypothesize that the custom of dowry is less prevalent and hence less acceptable among Muslims. Using data from the National Family Health Survey conducted in 1992–93, they document that Muslims in Bihar are less likely to approve of dowry. Ashraf (1997) has documented that dowry deaths are less prevalent among Muslim communities due to the option of 'talaq' or divorce available to men. Waheed (2009) indicates that bride burning is uncommon among Muslims. In the literature on fertility choices and preferences for male children, one strand conjectures that male preference is lower among Muslims because the relative rarity of dowry makes female children less expensive. Bhat

[28]It is possible that weather shocks cause stress migration more generally. To the extent that the affected population migrates within the same district, as is typically the case (Duflo and Pande, 2007), the estimates capture the effects on those migrating households as well. Topalova (2010) shows that migration across districts in India is limited.

[29]Previous research shows that such assets are often depleted to smooth consumption (Rosenzweig and Wolpin, 1993)

[30]Wet Shocks that result in flooding can reduce farm income, which in turn can lead to an increase in demand for dowry.

and Zavier (2003) provide evidence for Northern India using NFHS data.

Given this divergence in preferences and practices, if the incentive to draw more dowry is driving our results, we should observe a smaller effect in districts with a high population share of Muslims. Table 7 reports our test of this hypothesis. In column 1, wet and dry shocks are interacted with a dummy for a Muslim population fraction above the national median in the 2001 Census. As expected, we do not find an effect of dry shocks in districts that have a high share of Muslim population. By contrast, we do observe an increase in dowry deaths in response to dry shocks in districts with a low share of Muslim population. This also allays the concern that our results are driven by only strategic reporting differences by families of the deceased wife. That would only be the case if, alternatively, districts with more Muslims were differentially less likely to increase their reporting during dry years compared to other districts, which seems unlikely.

The crime patterns we observe could also be influenced by geographic variation in sex ratios or attitudes towards women. Edlund et al. (2007) demonstrate using Chinese data that areas with higher (female-to-male) sex ratios have lower crime rates. Sex ratios could also be influenced by underlying attitudes towards women, and these attitudes could have a direct bearing on gender-specific crimes (Drèze and Khera, 2000).

We test whether our results vary by sex ratios. We categorize districts as more female if the 2001 female-to-male sex ratio is greater than the national median for that year.[31] We then interact this female indicator with the dry and wet shock splines. Results are reported in column 2 of Table 7. We cannot reject the hypothesis that dowry deaths have the same response to dry and wet rain shocks in both kinds of districts.

7. Empowering Women through Political Representation

Political representation of women can influence the incidence and reporting of crimes against women. It can increase punishments and policing effort directed toward such crimes, consequently decreasing them. To the extent that most crimes are generally

[31] Contemporaneous sex ratios can be endogenous to shocks, as demonstrated by Rose (1999), but we use predetermined ratios.

underreported, female representation could motivate women to come forward and report them (Iyer, Mani, Mishra, and Topalova, 2012). Members of Parliament (MPs) also have access to significant resources that can be spent on the welfare of their constituents. This spending has been discretionary since 1993. If female representatives have stronger preferences to improve the welfare of women, they may spend more on awareness campaigns or services for the protection of women, or they may provide direct relief to women in times of economic distress.[32] Thus, they may mitigate the risk faced by women.

In order to explore this possibility, we evaluate whether the impact of rain shocks varies by female political representation. For each parliamentary constituency in the country, we find the gender of the elected MP in the 13th (1999-2004) and 14th (2004-2009) Lok Sabha.[33] Parliamentary constituencies and districts do not nest. We determine whether there is a constituency represented by a woman falling at least partially within each district, and if so, how many such constituencies. Elections were not held in all districts in these years, so we first reestimate our benchmark model on the districts in which elections were held. The results are reported in column 1 of Table 8. The patterns are consistent with results reported in Table 2, despite the reduced sample. Next, we include the number of female MPs in a district interacted with year indicators as additional controls in column 2. The number of female MPs is potentially endogenous in this case, but it is instructive to note that controlling for it in the regression does not substantially change the estimated rainfall coefficients. Finally, we construct an indicator for any female MP in these districts for the year prior to that in which the shock is realized and interact it with the wet and dry shock splines.[34] Results are reported in column 3. In this case as well, we cannot reject the hypothesis that the response of dowry deaths to wet and dry shocks is the same in both types of districts—those with and without any female MPs.

The presence of female MPs may be endogenous. In columns 4–6, we replicate the

[32]Chattopadhyay and Duflo (2004) evaluate a policy that mandated political representation of women in local village councils and find that women and men do have different preferences for public goods.

[33]The Lok Sabha is the directly elected lower house of Parliament.

[34]Since the female MP is already chosen before the shock is realized, the shock cannot affect the representation and hence it is not endogenous.

specifications from columns 1–3, limiting our sample to districts with elections in which women win or lose by a margin of less than 25 percent.[35] The point estimates for dry shocks are similar to those in columns 1–3, but the standard errors are larger, as we expect because of the substantially smaller sample size. Wet shocks have an effect on dowry deaths that is significant in this subsample, but again, female representation does not have a significant effect.

From a policy perspective, our results do not provide support for the proposition that reservation in the national parliament will mitigate appropriation risk faced by women in times of economic adversity. It is possible that female officials in local and state governments are in a better position to offer protection to women than their national counterparts. We cannot employ our data to examine this possibility.

8. Conclusion

Our findings show that rainfall shocks have a significant effect on dowry deaths. We show consistent evidence on domestic violence, and suggestive evidence that dry shocks increase dowry payments. Taken together, we interpret these findings as evidence that negative weather shocks increase the risk of appropriation faced by women. This behavior to increase economic returns through appropriation by resorting to dowry killings may be a consumption smoothing mechanism. Since vulnerable segments of society are less able to adapt (Jayachandran, 2006), it is important to estimate what additional risks they face in light of changing precipitation patterns, and what strategies can mitigate these risks. Policies aimed at allaying the effects of risks and uncertainties generated by weather shocks will need to especially ensure the well-being of women. Increased access to weather insurance[36] may lead to reduced appropriation risks faced by women. Examining how access to coping mechanisms like weather insurance affects the appropriation risks faced by women is an important avenue of future research.

[35] There are very few observations in which women win by narrower margins than this. The qualitative results remain the same if we restrict to 10, 15 or 20 percent margins. Since these are less reliable due to lack of variation, we do not report them.

[36] Some studies, including Lilleor et al. (2005), examine the take-up of weather insurance and the impact on agricultural investments.

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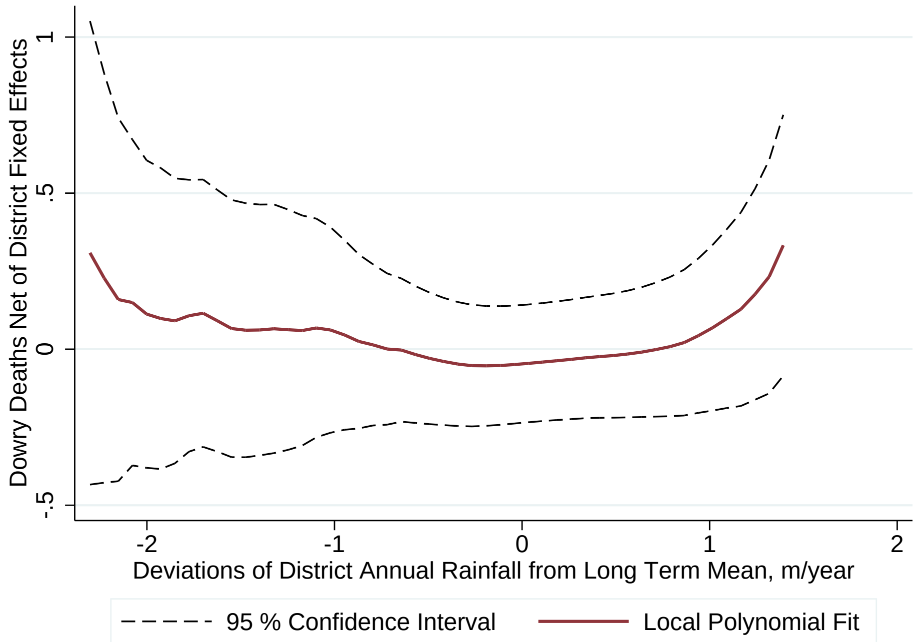
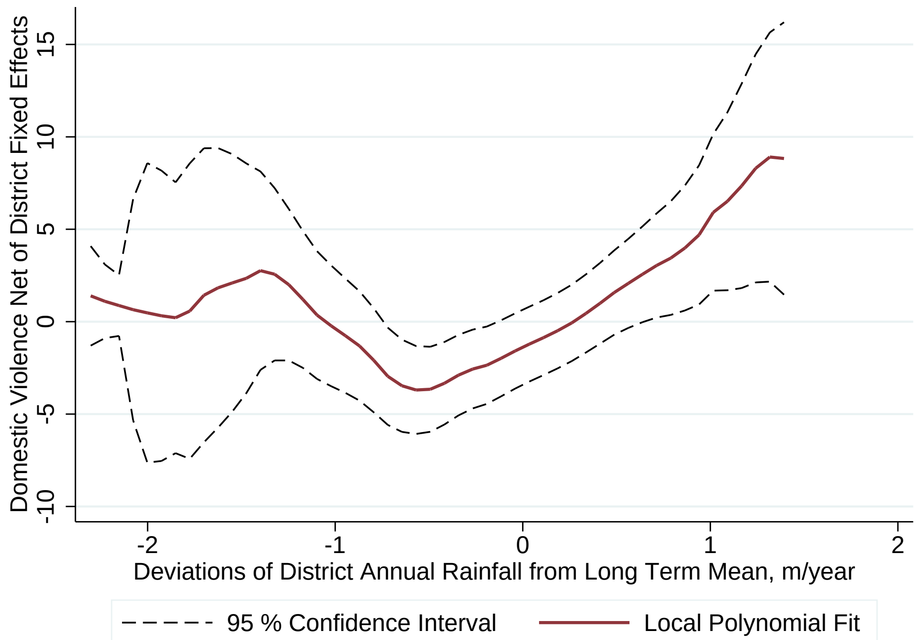


(a) Dowry deaths



(b) Domestic violence

Figure 1: Local polynomial regression of crimes net of district fixed effects

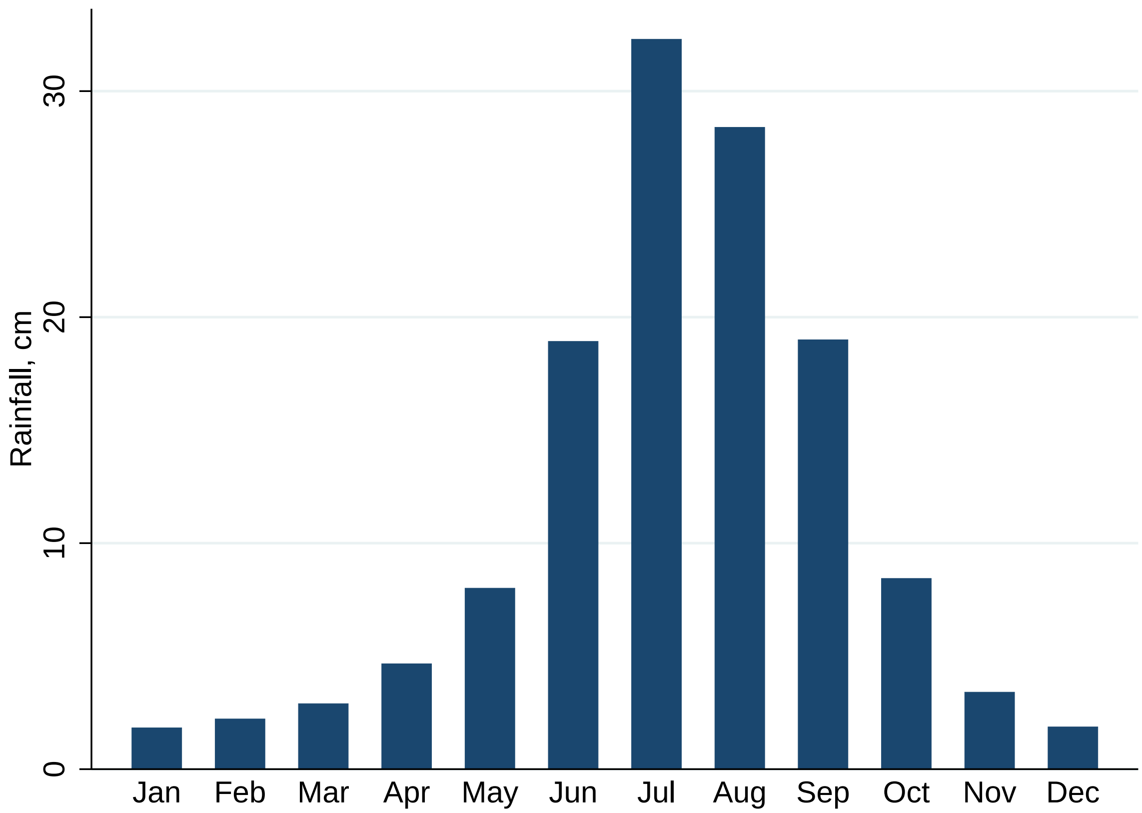


Figure 2: Average rainfall across Indian districts by month, 1971–2000

Table 1: Summary Statistics

Variable	Statistic	2002	2003	2004	2005	2006	2007	Overall
Average	Mean	1.04	1.36	1.34	1.37	1.36	1.39	1.31
Rainfall	Min	0.1	0.34	0.13	0.3	0.26	0.36	0.1
meters/	Max	3.25	2.69	3.3	3.41	3.23	3.25	3.41
year	SD	0.49	0.45	0.54	0.55	0.51	0.52	0.53
Dowry	Mean	11.7	10.6	12	11.6	13	13.8	12.1
Deaths	Min	0	0	0	0	0	0	0
	Max	83	85	98	87	168	94	168
	SD	14	12	14	14	16	16	15
Domestic	Mean	84	87	100	100	108	130	101
Violence	Min	0	0	0	0	0	0	0
	Max	1245	1625	1661	2010	1998	2246	2246
	SD	111	137	144	151	162	200	154
Crimes	Mean	199	202	219	218	234	263	223
against	Min	0	0	0	0	0	0	0
women	Max	1954	2416	2375	2871	2756	2950	2950
	SD	205	225	235	242	253	294	245
Total	Mean	3025	2916	3113	3101	3197	3377	3122
Crimes	Min	28	14	24	32	34	32	14
	Max	29120	31093	31473	33250	32967	32447	33250
	SD	3265	3396	3573	3547	3577	3709	3515
Observations		583	583	583	583	583	583	3498

Table 2: Effect of Local Weather Shocks on Dowry Deaths

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dry Shock	0.317***	0.317***	0.290***	0.258***	0.289***	0.310***	0.308***	0.268**
	[0.0917]	[0.0990]	[0.0972]	[0.0966]	[0.0989]	[0.0766]	[0.0973]	[0.106]
Wet Shock	0.0656	0.0643	0.0744	0.0728	0.0784	0.0279	0.0482	0.0788
	[0.0450]	[0.0549]	[0.0557]	[0.0537]	[0.0540]	[0.0347]	[0.0493]	[0.0630]
Observations	3,138	3,138	3,138	3,138	3,138	3,138	3,138	2,916
Districts	523	523	523	523	523	523	523	486
Census controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	None	None	Total crimes	Crimes against women	Murders	District trends	Outlier dummy	Exclude big-city districts
F stat	12.94	10.89	9.819	8.178	9.955	16.55	10.76	7.070
Sig. level	0.00155	0.00431	0.00738	0.0168	0.00689	0.000255	0.00460	0.0292

Notes: Each column presents estimated coefficients from a separate conditional fixed effects Poisson regression for the number of dowry deaths in a district-year. “Dry Shock” is the absolute deviation of rainfall below the long run (1971-2000) mean in meters/year. “Wet Shock” is the analogous variable above the mean. Standard errors are reported in brackets and are clustered by district (except in column 6). All regressions include district and year fixed effects. Socioeconomic controls are district values in the 2001 census for percent literate, percent employed, percent scheduled caste, and total population, all interacted with year indicators. *** indicates significance at 1, ** at 5, and * at 10 percent level. Out of 583 districts, 523 have non-zero values of the dependent variable. The null hypothesis of the reported F test is that both shock coefficients are zero.

Table 3: Effect of Local Weather Shocks on Other Crimes

	(1) Domestic violence	(2) Crimes targeting women	(3) Overall crimes	(4) Murder	(5) Robbery	(6) Burglary	(7) Riots	(8) Kidnapping/ abduction
Dry Shock	0.278***	0.147**	0.0621	0.0587	0.0615	0.0587	0.193**	0.146*
	[0.0797]	[0.0682]	[0.0438]	[0.0452]	[0.0911]	[0.0706]	[0.0967]	[0.0874]
Wet Shock	-0.00775	0.0389	-0.00455	-0.0344	0.0406	-0.0104	0.0188	-0.0124
	[0.0327]	[0.0262]	[0.0141]	[0.0261]	[0.0407]	[0.0248]	[0.0632]	[0.0320]
Observations	3,354	3,498	3,498	3,498	3,468	3,492	3,408	3,486
Districts	559	583	583	583	578	582	568	581

Notes: Each column presents estimated coefficients from a separate conditional fixed effects Poisson regression for the number of reported crimes in the listed category in a district-year. “Dry Shock” is the absolute deviation of rainfall below the long run (1971-2000) mean in meters/year. “Wet Shock” is the analogous variable above the mean. Standard errors are reported in brackets and are clustered by district. All regressions include district and year fixed effects and 4 socioeconomic controls: percent literate, percent employed, percent scheduled caste, and total population, all interacted with year indicators. *** indicates significance at 1, ** at 5, and * at 10 percent level.

Table 4: Effect of Local Weather Shocks on Crimes by Severity of Shocks

	(1) Dowry deaths	(2) Robbery	(3) Burglary	(4) Kidnapping/ abduction	(5) Domestic violence
>2.625 SD Below	0.186**	0.0798	0.0582	0.150	0.222***
	[0.0733]	[0.0753]	[0.0660]	[0.0914]	[0.0678]
1.875-2.625 SD Below	0.168***	0.0773	-0.00515	0.120**	0.138**
	[0.0620]	[0.0638]	[0.0543]	[0.0530]	[0.0583]
1.125-1.875 SD Below	0.0783*	0.0698	0.0563*	0.0754**	0.0956**
	[0.0451]	[0.0449]	[0.0337]	[0.0354]	[0.0419]
0.375-1.125 SD Below	0.0662**	-0.00536	0.0211	0.0709***	0.0124
	[0.0303]	[0.0332]	[0.0247]	[0.0243]	[0.0346]
0.375-1.125 SD Above	-0.0141	0.0386	0.00887	-0.0211	0.00891
	[0.0246]	[0.0260]	[0.0200]	[0.0262]	[0.0240]
1.125-1.875 SD Above	0.0175	-0.0188	0.0125	-0.0360	-0.0361*
	[0.0347]	[0.0277]	[0.0158]	[0.0228]	[0.0217]
1.875-2.625 SD Above	0.00961	-0.0146	-0.00740	-0.0135	-0.0263
	[0.0325]	[0.0361]	[0.0253]	[0.0258]	[0.0290]
>2.625 SD Above	0.00776	0.0333	-0.00698	-0.0174	0.0115
	[0.0418]	[0.0420]	[0.0212]	[0.0323]	[0.0315]
Observations	3,138	3,468	3,492	3,486	3,354
Districts	523	578	582	581	559

Notes: Each column presents estimated coefficients from a separate conditional fixed effects Poisson regression for the quantity of each crime in a district-year. The independent variables are indicators for standardized deviations of rainfall from the long run (1971-2000) mean. Deviations within 0.375 standard deviations of the mean are the excluded category. Standard errors are reported in brackets and are clustered by district. All regressions include district and year fixed effects and 4 socioeconomic controls: percent literate, percent employed, percent scheduled caste, and total population, all interacted with year indicators. *** indicates significance at 1, ** at 5, and * at 10 percent level.

Table 5: Effect of Local Weather Shocks on Dowry Deaths by Timing of Shocks

	(1)	(2)	(3)	(4)
Dry Shock (JJAS)	0.122***	0.140***	0.160***	0.154***
	[0.0386]	[0.0378]	[0.0388]	[0.0390]
Wet Shock (JJAS)	0.0184	0.0192	0.0190	0.0186
	[0.0302]	[0.0314]	[0.0328]	[0.0330]
Dry Shock (OND)		0.111	0.0975	0.0831
		[0.0819]	[0.0852]	[0.0800]
Wet Shock (OND)		-0.0152	-0.0165	-0.0175
		[0.0453]	[0.0489]	[0.0484]
Dry Shock (AM)		0.0394	0.0456	0.0319
		[0.0742]	[0.0785]	[0.0762]
Wet Shock (AM)		0.0406	0.0434	0.0462
		[0.0500]	[0.0486]	[0.0481]
Dry Shock (JFM)		0.144	0.165	0.138
		[0.183]	[0.177]	[0.187]
Wet Shock (JFM)		-0.103	-0.0877	-0.0514
		[0.169]	[0.170]	[0.152]
Lagged Dry Shock (JJAS)			0.0895**	0.0621
			[0.0452]	[0.0406]
Lagged Wet Shock (JJAS)			0.0134	0.00260
			[0.0491]	[0.0497]
Lagged Dry Shock (OND)			0.0603	0.0341
			[0.0658]	[0.0624]
Lagged Wet Shock (OND)			-0.0215	-0.0145
			[0.0314]	[0.0326]
outlier				1.449***
				[0.0420]
Observations	3,138	3,138	3,138	3,138
Districts	523	523	523	523

Notes: Each column presents estimated coefficients from a separate conditional fixed effects Poisson regression for the number of dowry deaths in a district-year. “Dry Shock” is the absolute deviation of rainfall below the long run (1971-2000) mean in the specific months within the defined periods. “Wet Shock” is the analogous variable above the mean. JJAS shocks are dry and wet shocks June-September, OND are October-December, JFM are January-March, and AM are April and May. Standard errors are reported in brackets and are clustered by district. All regressions include district and year fixed effects and 4 socioeconomic controls: percent literate, percent employed, percent scheduled caste, and total population, all interacted with year indicators. *** indicates significance at 1, ** at 5, and * at 10 percent level.

Table 6: Effects of Lags and Leads of Local Weather Shocks on Dowry Deaths

	(1)	(2)	(3)	(4)
Dry Shock(t)	0.294***		0.290***	0.300***
	[0.108]		[0.109]	[0.112]
Wet Shock(t)	-0.00848		-0.0219	-0.00169
	[0.0754]		[0.0798]	[0.0756]
Dry Shock(t-1)		-0.0231	0.0259	
		[0.102]	[0.104]	
Wet Shock(t-1)		-0.110	-0.0913	
		[0.106]	[0.112]	
Dry Shock(t+1)				0.0178
				[0.141]
Wet Shock(t+1)				0.0289
				[0.0850]
Observations	3,138	3,138	3,138	3,138
Districts	523	523	523	523

Notes: Each column presents estimated coefficients from a separate conditional fixed effects Poisson regression for the number of dowry deaths in a district-year. "Dry Shock" is the absolute deviation of rainfall below the long run (1971-2000) mean in meters/year. "Wet Shock" is the analogous variable above the mean. Lags and leads of dry and wet shocks are analogously defined for the year prior and year after the contemporaneous shocks. Standard errors are reported in brackets and are clustered by district. All regressions include district and year fixed effects and 4 socioeconomic controls: percent literate, percent employed, percent scheduled caste, and total population, all interacted with year indicators. *** indicates significance at 1, ** at 5, and * at 10 percent level.

Table 7: Heterogeneous Effects of Local Weather Shocks on Dowry Deaths

	(1)	(2)
Dry Shock	0.833***	0.354***
	[0.252]	[0.119]
Wet Shock	0.0939	0.0831
	[0.0672]	[0.0760]
1(High Muslim fraction)*Dry Shock	-0.618**	
	[0.266]	
1(High Muslim fraction)*Wet Shock	-0.0521	
	[0.0944]	
1(High sex ratio)*Dry Shock		-0.0884
		[0.186]
1(High sex ratio)*Wet Shock		-0.0403
		[0.0920]
Observations	3,138	3,138
Districts	523	523

Notes: Each column presents estimated coefficients from a separate conditional fixed effects Poisson regression for the number of dowry deaths in a district-year. "Dry Shock" is the absolute deviation of rainfall below the long run (1971-2000) mean in meters/year. "Wet Shock" is the analogous variable above the mean. Standard errors are reported in brackets and are clustered by district. "High Muslim Fraction is an indicator which takes value 1 if the fraction of Muslim population in the district as per 2001 Census of India exceeds the national median. "High Sex Ratio" is an indicator which takes value 1 if the 2001 Census sex ratio is higher than the national median. All regressions include district and year fixed effects and 4 socioeconomic controls: percent literate, percent employed, percent scheduled caste, and total population, all interacted with year indicators. *** indicates significance at 1, ** at 5, and * at 10 percent level.

Table 8: Women's Political Representation and Dowry Deaths

	(1)	(2)	(3)	(4)	(5)	(6)
Dry Shock	0.290***	0.286***	0.276**	0.313	0.274	0.234
	[0.107]	[0.107]	[0.116]	[0.263]	[0.268]	[0.297]
Wet Shock	0.0559	0.0524	0.0106	0.212*	0.203*	0.194*
	[0.0607]	[0.0599]	[0.0579]	[0.116]	[0.114]	[0.116]
1(Female MPs)*Dry Shock			0.0435			0.0978
			[0.233]			[0.468]
1(Female MPs)*Wet Shock			0.196			0.0191
			[0.139]			[0.188]
Observations	2,358	2,358	2,358	678	678	678
Districts	393	393	393	113	113	113
Sample	Elections	Elections	Elections	Close elections	Close elections	Close elections
Other controls	None	Female MP	Female MP	None	Female MP	Female MP

Notes: Each column presents estimated coefficients from a separate conditional fixed effects Poisson regression for the number of dowry deaths in a district-year. "Dry Shock" is the absolute deviation of rainfall below the long run (1971-2000) mean in meters/year. "Wet Shock" is the analogous variable above the mean. "Female MP" is an indicator for the presence of a female MP in a constituency overlapping with the district. Standard errors are reported in brackets and are clustered by district. All regressions include district and year fixed effects and 4 socioeconomic controls: percent literate, percent employed, percent scheduled caste, and total population, all interacted with year indicators. *** indicates significance at 1, ** at 5, and * at 10 percent level.

Appendix A. Additional Results

Table A.1: Effects of Local Weather Shocks on Dowry Deaths using Alternate Specifications

	(1) OLS	(2) Neg. binomial
Dry Shock	1.635**	0.253***
	[0.692]	[0.0928]
Wet Shock	0.289	0.0485
	[0.608]	[0.0465]
Observations	3,498	3,138
Districts	583	523
F stat	2.812	8.531
Sig. level	0.0609	0.0140

Notes: Each column presents estimated coefficients from a separate regression for the the quantity of each crime in a district-year. "Dry Shock" is the absolute deviation of rainfall below the long run (1971-2000) mean in meters/year. "Wet Shock" is the analogous variable above the mean. Standard errors are reported in brackets and are clustered by district. All regressions include district and year fixed effects and 4 socioeconomic controls: percent literate, percent employed, percent scheduled caste, and total population, all interacted with year indicators. *** indicates significance at 1, ** at 5, and * at 10 percent level. The null hypothesis of the reported F test is that both shock coefficients are zero.

Table A.2: Effect of Local Weather Shocks on Dowry Deaths by Severity of Shocks using Alternative Bins

	(1) Dowry deaths	(2) Robbery	(3) Burglary	(4) Kidnapping/ abduction	(5) Domestic violence
>2.25 SD Below	0.138**	0.107*	0.0271	0.167***	0.168***
	[0.0693]	[0.0606]	[0.0496]	[0.0499]	[0.0634]
1.75-2.25 SD Below	0.235***	0.142*	0.0109	0.124**	0.192***
	[0.0665]	[0.0725]	[0.0538]	[0.0533]	[0.0581]
1.25-1.75 SD Below	0.0574	0.0709	0.0570*	0.0715**	0.0720
	[0.0455]	[0.0511]	[0.0344]	[0.0358]	[0.0447]
0.75-1.25 SD Below	0.130***	0.0315	0.0414	0.102***	0.0723*
	[0.0410]	[0.0441]	[0.0322]	[0.0322]	[0.0383]
0.25-0.75 SD Below	0.0571*	0.0105	0.00880	0.0422*	0.0220
	[0.0311]	[0.0294]	[0.0212]	[0.0251]	[0.0400]
0.25-0.75 SD Above	0.00391	0.0580*	0.0342	-0.000134	0.0156
	[0.0296]	[0.0317]	[0.0243]	[0.0330]	[0.0275]
0.75-1.25 SD Above	-0.00698	0.00929	3.62e-05	-0.0285	-0.0156
	[0.0317]	[0.0334]	[0.0168]	[0.0249]	[0.0244]
1.25-1.75 SD Above	0.0181	-0.000139	-0.00866	-0.0455*	-0.0385
	[0.0460]	[0.0362]	[0.0177]	[0.0260]	[0.0239]
1.75-2.25 SD Above	0.0363	-2.42e-05	0.0202	-0.00274	-0.0446
	[0.0369]	[0.0333]	[0.0221]	[0.0284]	[0.0304]
>2.25 SD Above	-0.00655	0.0190	0.00309	-0.0265	-0.00736
	[0.0376]	[0.0432]	[0.0204]	[0.0262]	[0.0248]
Observations	3,138	3,468	3,492	3,486	3,354
Districts	523	578	582	581	559

Notes: Each column presents estimated coefficients from a separate conditional fixed effects Poisson regression for the number of dowry deaths in a district-year. The independent variables are indicators for standardized deviations of rainfall from the long run (1971-2000) mean. Deviations within 0.25 standard deviations of the mean are the excluded category. Standard errors are reported in brackets and are clustered by district. All regressions include district and year fixed effects and 4 socioeconomic controls: percent literate, percent employed, percent scheduled caste, and total population, all interacted with year indicators. *** indicates significance at 1, ** at 5, and * at 10 percent level.

Table A.3: Effect of Local Weather Shocks on Planting and Agricultural Production

	(1) Area Sown	(2) Production
>2.625 SD Below	-0.0513***	-0.144**
	[0.0166]	[0.0571]
1.875-2.625 SD Below	-0.0387**	-0.0846
	[0.0160]	[0.0542]
1.125-1.875 SD Below	-0.0452***	-0.108**
	[0.0148]	[0.0458]
0.375-1.125 SD Below	-0.0260**	-0.150**
	[0.0113]	[0.0591]
0.375-1.125 SD Above	0.0147	-0.0277
	[0.00983]	[0.0298]
1.125-1.875 SD Above	-0.00296	-0.0130
	[0.0139]	[0.0416]
1.875-2.625 SD Above	0.0501***	0.167***
	[0.0166]	[0.0429]
>2.625 SD Above	0.116***	0.258***
	[0.0232]	[0.0523]
Observations	3,190	3,190
Districts	551	551

Notes: Each column presents estimated coefficients from a separate OLS regression. The dependent variables are measured in millions of tons and millions of hectares, respectively. The independent variables are indicators for standardized deviations of rainfall from the long run (1971-2000) mean. Deviations within 0.375 standard deviations of the mean are the excluded category. Standard errors are reported in brackets and are clustered by district. All regressions include district and year fixed effects and 4 socioeconomic controls: percent literate, percent employed, percent scheduled caste, and total population, all interacted with year indicators. *** indicates significance at 1, ** at 5, and * at 10 percent level.

Table A.4: Dowry received as reported by males (thousand rupees)

	(1) Land	(2) Jewelry	(3) Cash	(4) Other Assets
Dry Shock(t)	-4.453	43.60	48.18	61.44**
	[21.50]	[38.04]	[59.97]	[25.90]
Wet Shock(t)	-15.92	-12.03	-27.45	27.59***
	[9.949]	[17.91]	[31.91]	[8.889]
Far Parents	-17.32**	-5.003	-30.25	19.91
	[7.869]	[17.74]	[34.59]	[21.55]
Far Parents*Dry Shock(t)	5.280	-45.34	-38.35	-52.95
	[16.57]	[35.99]	[73.51]	[36.01]
Far Parents*Wet Shock(t)	12.10	26.81	95.16	48.56
	[10.60]	[20.81]	[70.59]	[88.64]
Observations	910	916	798	592

Notes: Each column presents the regression coefficients from a separate OLS regression for dowry. "Dry Shock" is the absolute deviation of rainfall below the long run (1971-2000) mean in meters/year. "Wet Shock" is the analogous variable above the mean. "Far parents" live > 20 km away. Standard errors are clustered by district using the wild bootstrap of Cameron et al. (2008). *** indicates significance at 1, ** at 5 , and * at 10 percent level.