

Weather Shocks and Fertility: Evidence from Drought Exposure in Rural India

Online Supplement

1 Additional Tables

Table S1
Summary Statistics
Summary Statistics for Women with First Births Between 2006 and 2016

	Mean		Min	Max	N
<i>Women with first birth in 2006 or later</i>					
Hindu	0.75	0.43	0.00	1.00	114,340
Caste					
General Caste	0.22	0.41	0.00	1.00	113,725
Scheduled Caste	0.19	0.39	0.00	1.00	113,725
Scheduled Tribe	0.22	0.41	0.00	1.00	113,725
Other Backward Class	0.37	0.48	0.00	1.00	113,725
Wealth Quintiles					
First	0.27	0.44	0.00	1.00	114,340
Second	0.27	0.44	0.00	1.00	114,340
Third	0.22	0.42	0.00	1.00	114,340
Fourth	0.15	0.36	0.00	1.00	114,340
Fifth	0.09	0.29	0.00	1.00	114,340
Highest Education Level Attended	0.26	0.44	0.00	1.00	114,340
No Education	0.15	0.35	0.00	1.00	114,340
Primary	0.51	0.5	0.00	1.00	114,340
Secondary	0.08	0.27	0.00	1.00	114,340
Higher					
Age (in years, at the time of interview in 2015/16)	26.19	4.41	15.00	49.00	114,340
Age Distribution (in years, at the time of interview in 2015/16)					
15-20	0.04	0.18	0.00	1.00	114,340
20-30	0.75	0.43	0.00	1.00	114,340
30-40	0.20	0.40	0.00	1.00	114,340
40-49	0.01	0.10	0.00	1.00	114,340
Women's age in 2006 (in years)	16.72	4.39	5.00	40.00	114,340
Women's age at first birth (in years)	21.21	3.69	9.00	46.00	114,340
Women pregnant at the time of the interview	0.10	0.30	0.00	1.00	114,340

Notes: Summary statistics are presented for married women who had their first singleton birth between 2006 and 2016. General caste refers to socially advantaged groups in India. Scheduled Castes, Scheduled Tribes, and Other Backward Classes refer to constitutionally recognized disadvantaged groups.

Table S2

Drought and the Probability of Birth or Being Pregnant at the Time of Interview
for Women aged 18 or more (2006-2016)

Outcome: Birth indicator (including ongoing pregnancies in 2015/16)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Drought _{t-1}	-0.003 (0.002)	-0.010*** (0.002)	-0.007*** (0.002)	-0.004* (0.002)	-0.011*** (0.002)	-0.019*** (0.002)	-0.019*** (0.002)	-0.019*** (0.002)	-0.011*** (0.002)	-0.019*** (0.002)	-0.019*** (0.002)	-0.020*** (0.002)
Year		-0.017*** (0.000)	-0.017*** (0.000)	-0.002*** (0.000)		-0.017*** (0.000)	-0.017*** (0.000)	0.000 (0.000)		-0.017*** (0.000)	-0.017*** (0.000)	0.063*** (0.000)
Number of prior births				-0.066*** (0.001)				-0.076*** (0.001)				-0.355*** (0.001)
Fixed effects	No	No	No	No	District	District	District	District	Mother	Mother	Mother	Mother
Other covariates	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Observations	444,510	444,510	442,300	442,300	444,510	444,510	442,300	442,300	444,510	444,510	442,300	442,300
Adjusted R-squared	0.000	0.015	0.022	0.039	0.008	0.023	0.026	0.048	-0.047	-0.030	-0.030	0.155
Control-group Mean	0.202	0.202	0.202	0.202	0.202	0.202	0.202	0.202	0.202	0.202	0.202	0.202

Notes: Outcome is an indicator for singleton birth in a given year. For years 2015 and 2016 it also includes being pregnant at the time of the interview. Data are restricted to women who were 18 or more in any given year between 2006 and 2016. Controls include women's age cohort, women's education level, religion and caste, and wealth quintile. Drought is defined as a dummy variable that takes a value of one if the negative deviation in monsoon rainfall in year t from the long-term mean in a cluster is greater than or equal to 20%. Standard errors clustered by DHS cluster, in parentheses: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Table S3

ATT by Treated Groups for Callaway and Sant'Anna estimation

<i>ATT by Treated Groups</i>	
Group Average	-0.014** (0.004)
G2007	0.005 (0.011)
G2008	0.088* (0.053)
G2009	-0.025 (0.026)
G2010	-0.014 (0.011)
G2011	-0.003 (0.010)
G2012	0.010 (0.040)
G2013	0.041 (0.026)
G2014	-0.080*** (0.012)
G2015	-0.034* (0.019)
G2016	0.005 (0.006)

Notes: Table showed group-wise ATTs for the aggregate ATT-Group in Table 4. Standard errors clustered by DHS cluster, in parentheses: * $p < 0.1$;

** $p < 0.05$; *** $p < 0.01$.

Table S4
Droughts and the Probability of Birth
for Women aged 18 or more (2006-2016),
by Previous Male Birth

	<i>Outcome: Birth indicator</i>		
	(1)	(2)	(3)
Drought _{t-1}	-0.013*** (0.003)	-0.028*** (0.003)	-0.034*** (0.003)
Has previous son	-0.069*** (0.002)	-0.068*** (0.001)	-0.063*** (0.002)
Drought _{t-1} x Has previous son	0.010*** (0.004)	0.011*** (0.004)	0.021*** (0.004)
Year	-0.005*** (0.000)	-0.003*** (0.000)	0.060*** (0.000)
Number of prior births	-0.048*** (0.001)	-0.058*** (0.001)	-0.340*** (0.002)
Fixed effects	No	District	Mother
Other covariates	Yes	Yes	Yes
Observations	442,300	442,300	442,300
Adjusted R-squared	0.050	0.058	0.168
Control-group Mean	0.195	0.195	0.195

Notes: Outcome is an indicator for singleton birth in a given year. Data are restricted to married women who were 18 or more in any given year between 2006 and 2016. Controls include women's age cohort, women's education level, religion and caste, and wealth quintile. Drought is defined as an indicator variable that takes a value of one if the negative deviation in monsoon rainfall in year t from the long-term mean in a cluster is greater than or equal to 20%. Standard errors clustered by DHS cluster, in parentheses: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Table S5

Impact of Drought on the Probability of Birth for Women with 2 or fewer Prior Births
Callaway and Sant'Anna Estimation

	<i>Probability of Birth b/w 2007-16</i>		<i>Probability of Birth b/w 2007-16 or being pregnant at the time of interview</i>	
	<i>Never treated</i>	<i>Not yet treated</i>	<i>Never treated</i>	<i>Not yet treated</i>
	(1)	(2)	(3)	(4)
ATT - Simple	-0.000 (0.005)	-0.000 (0.005)	-0.002 (0.005)	-0.002 (0.005)
ATT - Group	-0.005 (0.004)	-0.005 (0.004)	-0.017*** (0.005)	-0.017*** (0.005)
Observations	221,991	221,991	221,991	221,991

Notes: Data are restricted to mothers who received only one or zero droughts between 2006 and 2016 and were aged 18 or more in any given year between 2006 and 2016. Drought is defined as an indicator variable that takes a value of one if the negative deviation in monsoon rainfall in year t from the long-term mean in a cluster is greater than or equal to 20%. The outcome in the estimations in columns (1) and (2) is an indicator for birth in a given year. In columns (3) and (4), the outcome also includes being pregnant at the time of the interview for years 2015 and 2016. “Never treated” in Columns (1) and (3) refers to the use of units that were never exposed to droughts as the control group in the Callaway and Sant’Anna estimation, as opposed to “Not yet treated” in Columns (2) and (4) where units not yet exposed to droughts were used as the control group. The number of children in year t is included as control. Standard errors clustered by DHS cluster, in parentheses: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Table S6

Impact of Drought on the Probability of Birth for Women with 3 or more Prior Births
Callaway and Sant'Anna Estimation

	<i>Probability of Birth b/w 2007-16</i>		<i>Probability of Birth b/w 2007-16 or being pregnant at the time of interview</i>	
	<i>Never treated</i>	<i>Not yet treated</i>	<i>Never treated</i>	<i>Not yet treated</i>
	(1)	(2)	(3)	(4)
ATT - Simple	-0.026*** (0.010)	-0.026** (0.010)	-0.027*** (0.010)	-0.027*** (0.010)
ATT - Group	-0.021*** (0.008)	-0.021*** (0.008)	-0.026*** (0.008)	-0.026*** (0.008)
Observations	92,653	92,653	92,653	92,653

Notes: Data are restricted to mothers who received only one or zero droughts between 2006 and 2016 and were aged 18 or more in any given year between 2006 and 2016. Drought is defined as an indicator variable that takes a value of one if the negative deviation in monsoon rainfall in year t from the long-term mean in a cluster is greater than or equal to 20%. The outcome in the estimations in columns (1) and (2) is an indicator for birth in a given year. In columns (3) and (4) the outcome also includes being pregnant at the time of the interview for years 2015 and 2016. “Never treated” in Columns (1) and (3) refers to the use of units that were never exposed to droughts as the control group in the Callaway and Sant’Anna estimation, as opposed to “Not yet treated” in Columns (2) and (4) where units not yet exposed to droughts were used as the control group. The number of children in year t is included as control. Standard errors clustered by DHS cluster, in parentheses: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Table S7
Impact of Drought on the Probability of Birth
Classic Two Way Fixed Effects Results

	<i>Outcome: Birth indicator</i>		<i>Outcome: Birth indicator (including ongoing pregnancies in 2015/16)</i>	
	(1)	(2)	(3)	(4)
Drought _{t-1}	-0.011*** (0.003)	0.007* (0.003)	-0.012*** (0.003)	0.005 (0.004)
Number of prior births		-0.350*** (0.002)		-0.349*** (0.002)
Observations	314,644	314,644	314,644	314,644
Adjusted R-squared	-0.014	0.181	-0.023	0.166
Control-group Mean	0.195	0.195	0.195	0.195

Notes: Data are restricted to mothers who received only one or zero droughts between 2006 and 2016 and were aged 18 or more in any given year between 2006 and 2016. The outcome in columns (1) and (2) is an indicator for birth in a given year. In columns (3) and (4) it also includes being pregnant at the time of the interview for years 2015 and 2016. Drought is defined as an indicator variable that takes a value of one if the negative deviation in monsoon rainfall in year t from the long-term mean in a cluster is greater than or equal to 20%. Standard errors clustered by DHS cluster, in parentheses: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table S8

Impact of Drought on the Probability of Birth
Callaway and Sant'Anna Estimation (Urban Women)

	<i>Probability of Birth b/w 2007-16</i>		<i>Probability of Birth b/w 2007-16 or being pregnant at the time of interview</i>	
	<i>Never treated</i>	<i>Not yet treated</i>	<i>Never treated</i>	<i>Not yet treated</i>
	(1)	(2)	(3)	(4)
ATT - Simple	-0.008 (0.007)	-0.005 (0.007)	-0.009 (0.007)	-0.007 (0.007)
ATT - Group	-0.002 (0.006)	0.001 (0.006)	-0.003 (0.006)	0.002 (0.006)
Observations	150,623	150,623	150,623	150,623

Notes: Data are restricted to mothers who received only one or zero droughts between 2006 and 2016 and were aged 18 or more in any given year between 2006 and 2016. Drought is defined as an indicator variable that takes a value of one if the negative deviation in monsoon rainfall in year t from the long-term mean in a cluster is greater than or equal to 20%. The outcome in the estimations in columns (1) and (2) is an indicator for birth in a given year. In columns (3) and (4) the outcome also includes being pregnant at the time of the interview for years 2015 and 2016. “Never treated” in Columns (1) and (3) refers to the use of units that were never exposed to droughts as the control group in the Callaway and Sant’Anna estimation, as opposed to “Not yet treated” in Columns (2) and (4) where units not yet exposed to droughts were used as the control group. The number of children in year t is included as control. Standard errors clustered by DHS cluster, in parentheses: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

2 Additional Figures

Figure S1
Sample Construction from DHS-India 2015–16

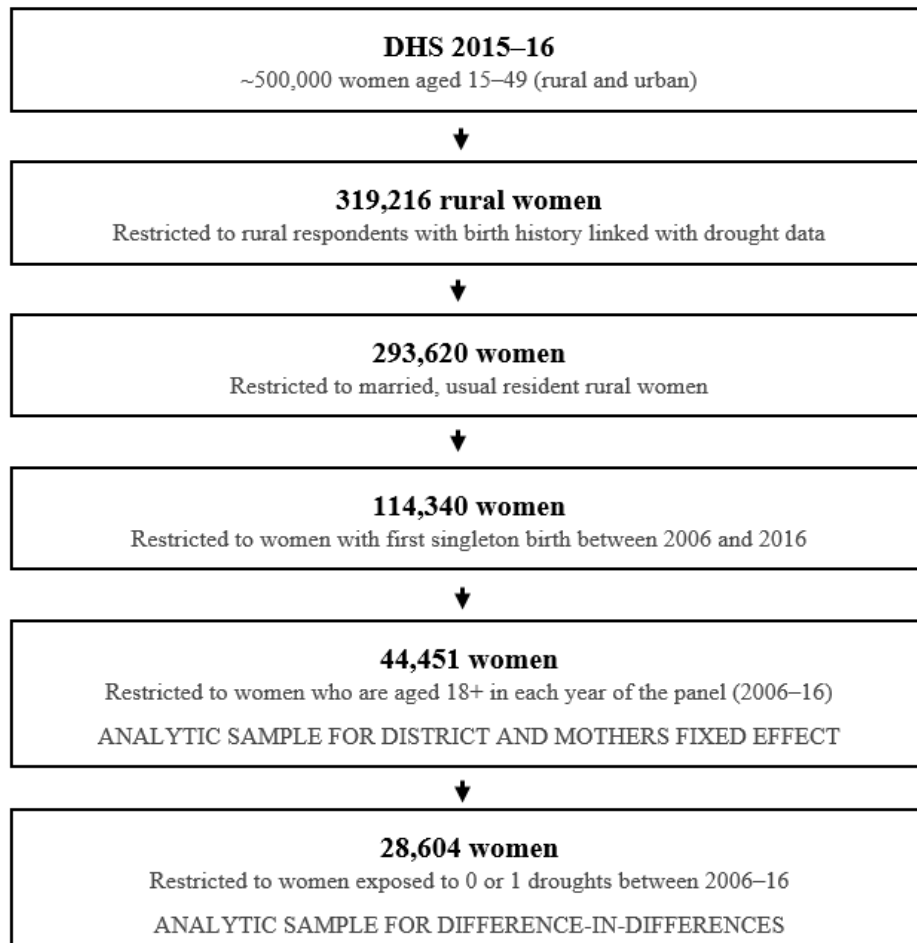
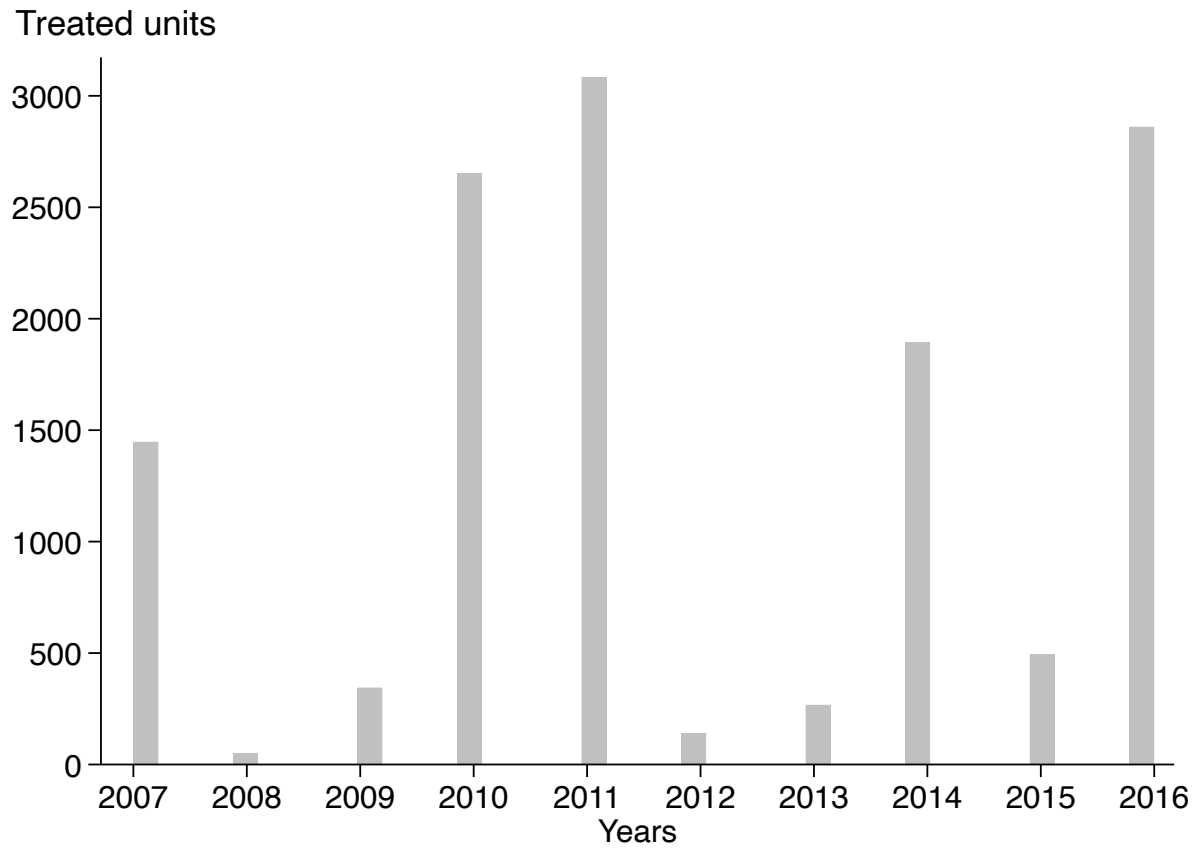
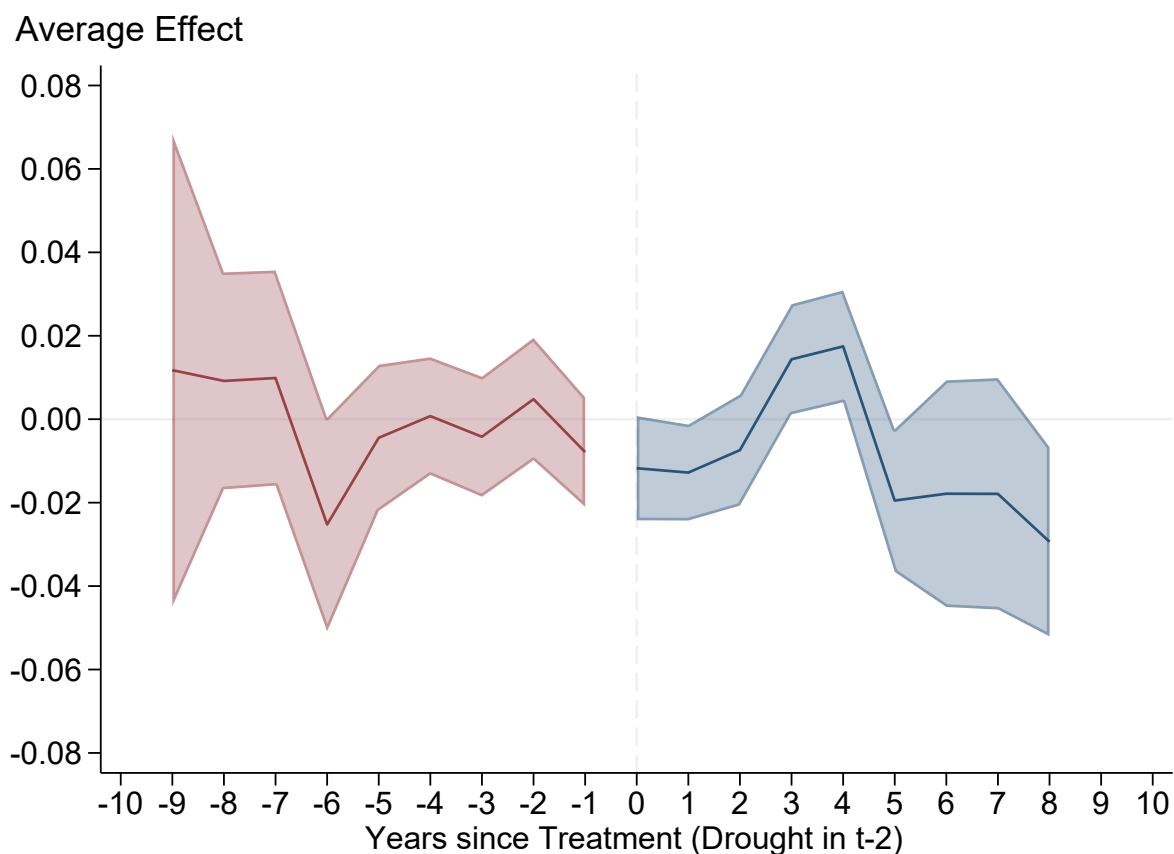


Figure S2
Treated Groups by Years for Callaway and Sant'Anna estimation



Notes: Data are restricted to mothers who were exposed to only one or zero droughts between 2006 and 2016 and were aged 18 or more in any given year between 2006 and 2016. The figure shows how many women received treatment in a given year. Treatment is defined as being ever exposed to drought in the previous year. For example, for women treated in 2014, the treatment is exposure to drought in 2013. Drought is defined as a dummy variable that takes a value of one if the negative deviation in monsoon rainfall in year t from the long-term mean in a cluster is greater than or equal to 20%.

Figure S3
Impact of Drought on the Probability of Birth for Women
Event Study Analysis
Callaway and Sant'Anna Estimation with Drought $t - 2$ as Treatment



Notes: Data are restricted to mothers who were exposed to only one or zero droughts between 2006 and 2016 and were aged 18 or more in any given year between 2006 and 2016. Results use “never treated” units as the control group. Treatment is defined as exposure to drought in year $t - 2$, where t is the year of birth. The event study estimates average effects on the probability of birth in each year from ten years before to ten years after treatment, relative to year 0, which is the year of treatment.