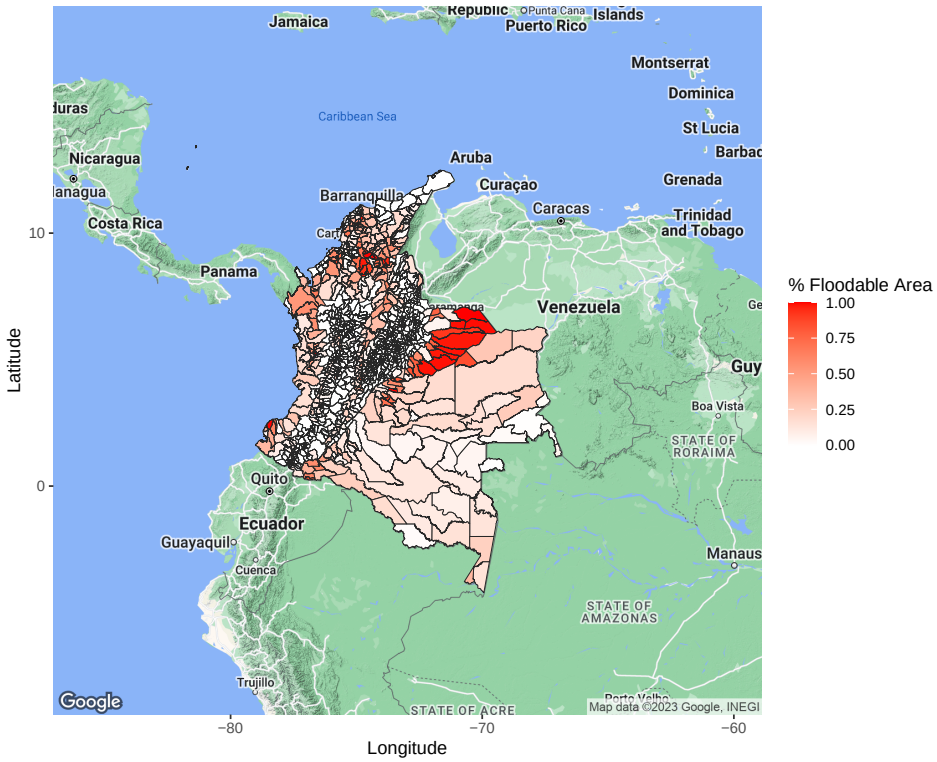
A Appendix: Additional Figures and Tables

Figure A.1: Areas affected by the Unusual Heavy Rain Disruption

(a) Areas Under Risk of Flooding (A_m^{2010})



(b) Affected Municipalities

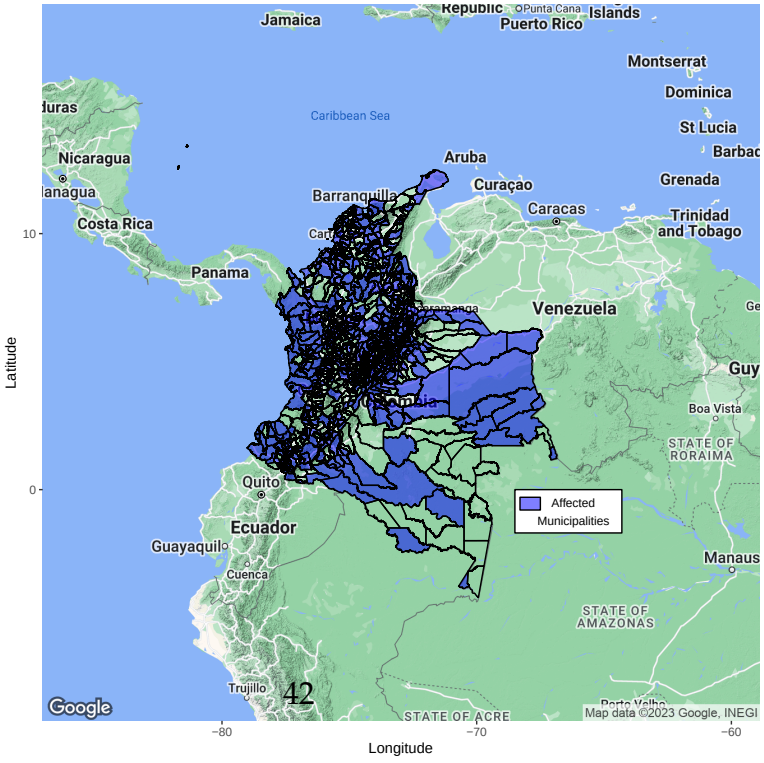
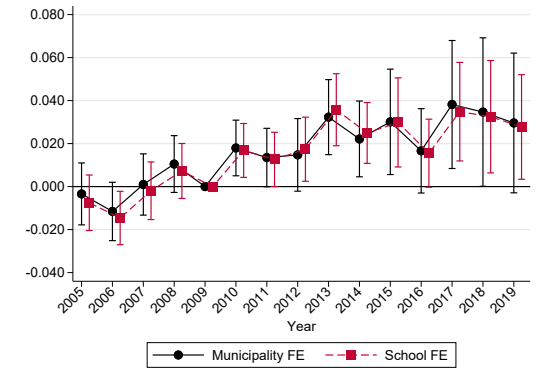
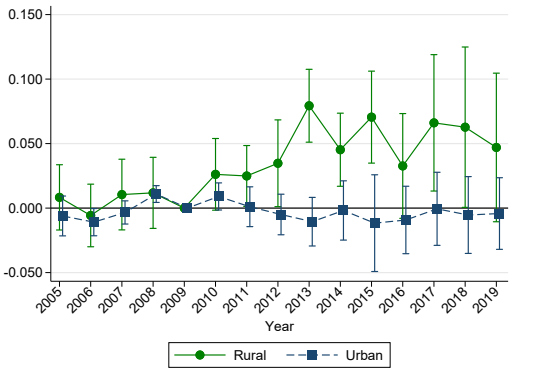


Figure A.2: Effects of Unusual Rain Disruption on Dropout Rates by Type of School

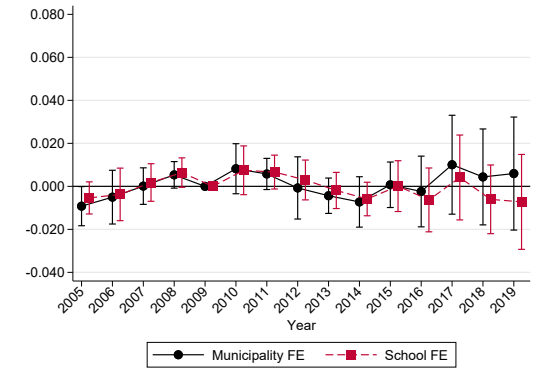
(a) Primary School



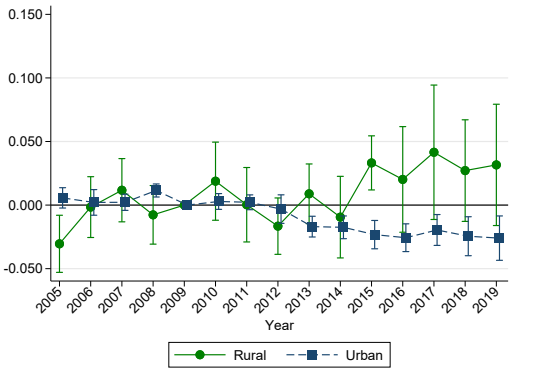
(b) Primary School (Urban VS Rural)



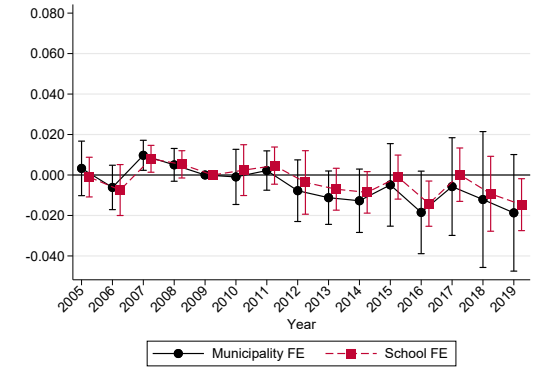
(c) Lower-Secondary School



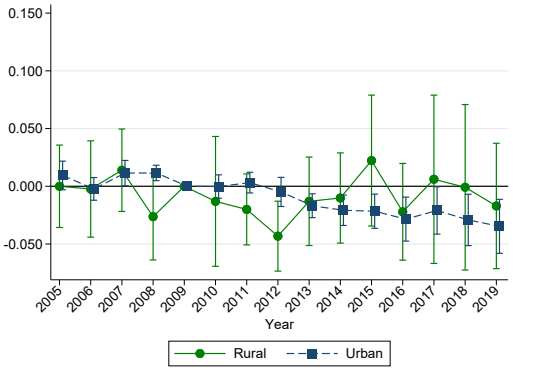
(d) Lower Secondary School (Urban VS Rural)



(e) Upper Secondary School



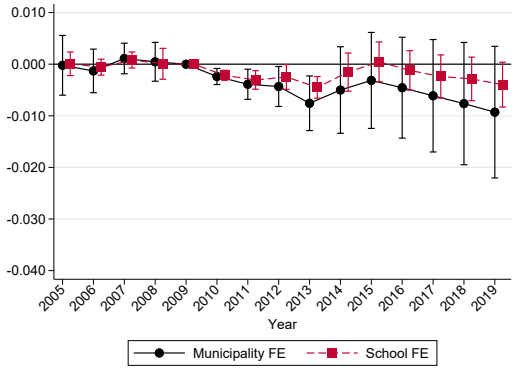
(f) Upper Secondary School (Urban VS Rural)



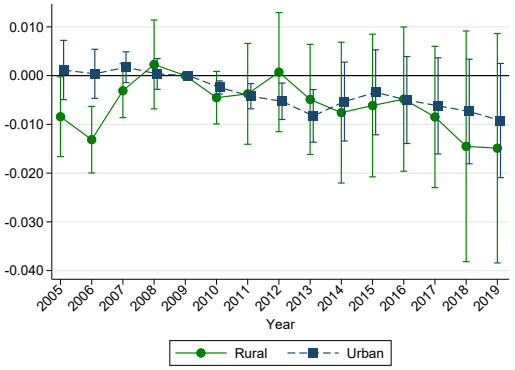
Notes. These figures present estimates of Equation 2 at the school level. The outcome corresponds to the dropout rate in different school levels. All the models are estimated using a Poisson regression. Left panels include all schools. The black line depicts a specification including municipality fixed effects, whereas the red line depicts a specification including school fixed effects. Right panels present estimates separately by urban and rural schools, estimated including municipality fixed effects. All the estimations include rural-by-year fixed effects and state-specific trends. Standard errors clustered at the municipality level. 95 percent confidence intervals are displayed.

Figure A.3: Effects of Unusual Rain Disruption on School Resources

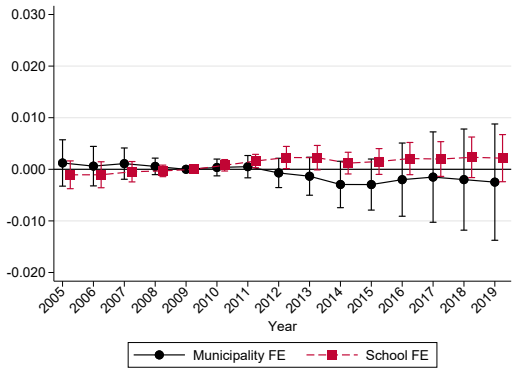
(a) Number of Teachers (Overall)



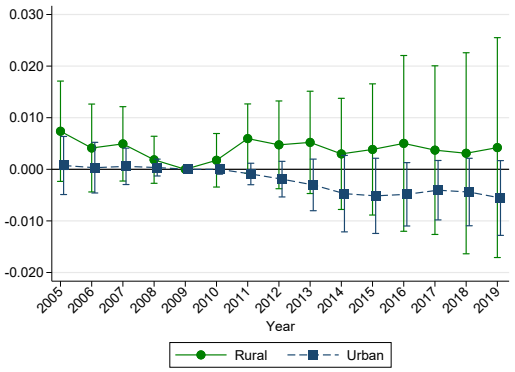
(b) Number of Teachers (Urban VS Rural)



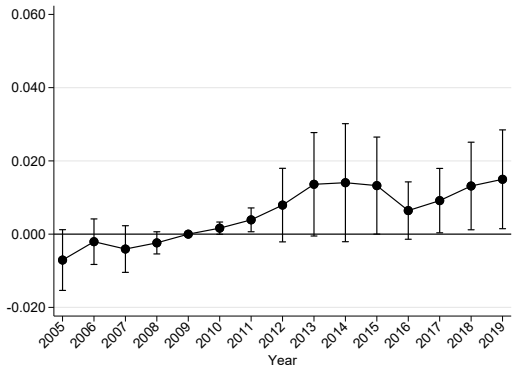
(c) Share Teachers with Tertiary Education (Overall)



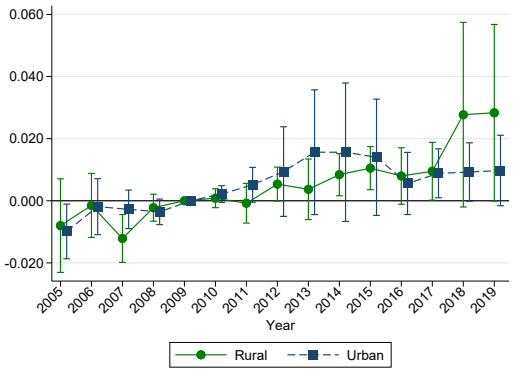
(d) Share Teachers with Tertiary Education (Urban VS Rural)



(e) Number of Schools per Municipality (Overall)



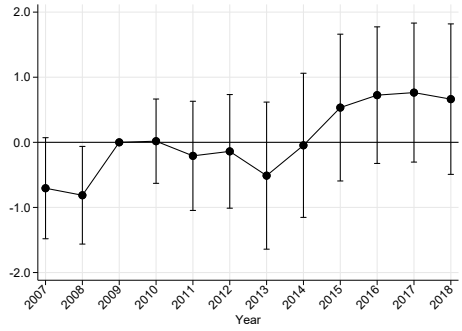
(f) Number of Schools per Municipality (Urban VS Rural)



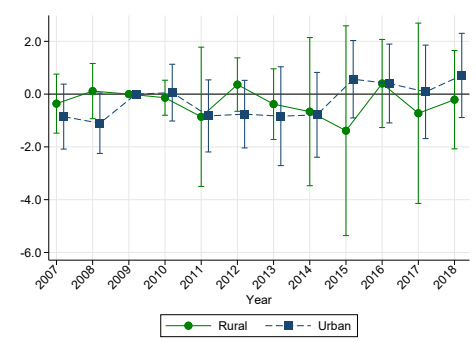
Notes. These figures present estimates of Equation (2) at the school level (panels A.3a, A.3b, A.3c, and A.3d) and municipality levels (panels A.3e and A.3f). The outcomes correspond to the number of teachers per school, the share of teachers with tertiary education, and number of schools per municipality. All models are estimated using a Poisson regression. Left panels include overall estimations, whereas right panels present estimates separately by urban and rural schools, estimated including municipality fixed effects. The first four estimations include school/municipality fixed effects, year-by-rural fixed effects, state-specific trends, and dummies for the type of school. The last two estimations include municipality and year fixed effects, and state-specific trends. Standard errors clustered at the municipality level. 95 percent confidence intervals are displayed.

Figure A.4: Effects of Unusual Rain Disruption on Poverty

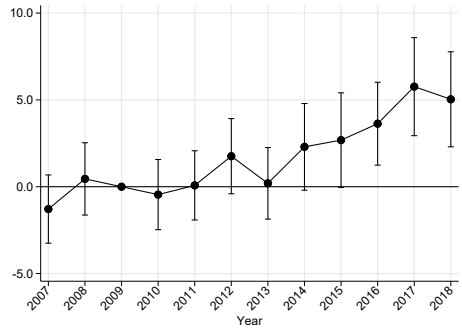
(a) Poverty (Overall)



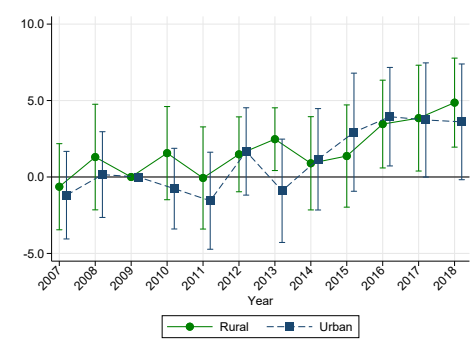
(b) Poverty (Urban VS Rural)



(c) Extreme Poverty (Overall)



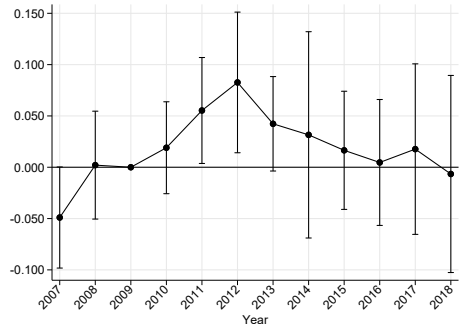
(d) Extreme Poverty (Urban VS Rural)



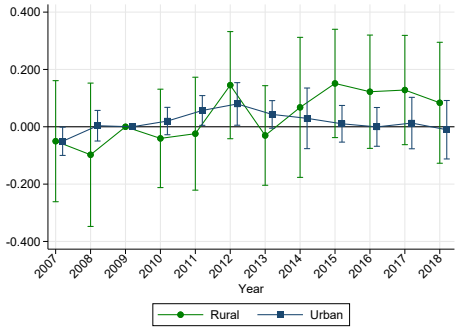
Notes. These figures present estimates of Equation (2) at the municipality level using the share of people in poverty (panels A.4a and A.4b) and extreme poverty (panels A.4c and A.4d) as outcomes. All the models are estimated using a Poisson regression. Left panels pool across all municipalities ($N = 7,363$). The black line depicts a specification including municipality and year fixed effects. Right panels present estimates separately by urban ($N = 7,077$) and rural schools ($N = 7,253$), estimated including municipality and year fixed effects. Standard errors clustered at the municipality level. 95 percent confidence intervals are displayed.

Figure A.5: Effects of Unusual Rain Disruption on Labor Market Outcomes

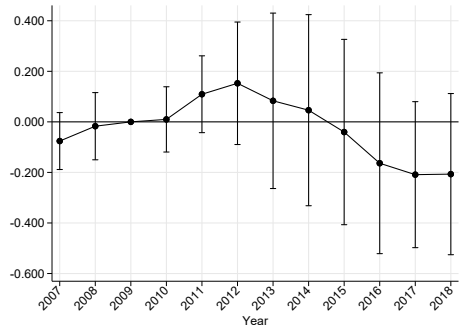
(a) Unemployed



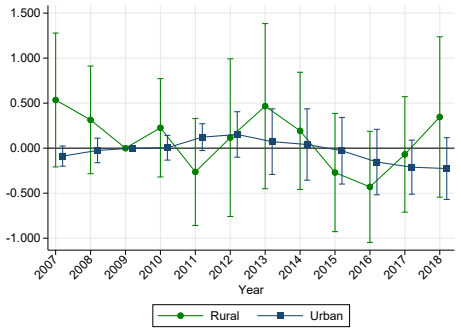
(b) Unemployed by Urban and Rural



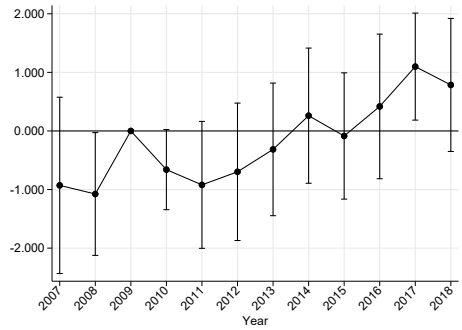
(c) Employed



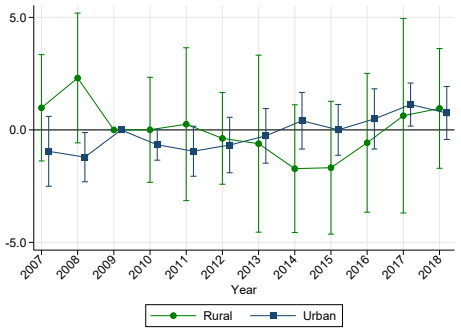
(d) Employed by Urban and Rural



(e) Log(Hours Worked)



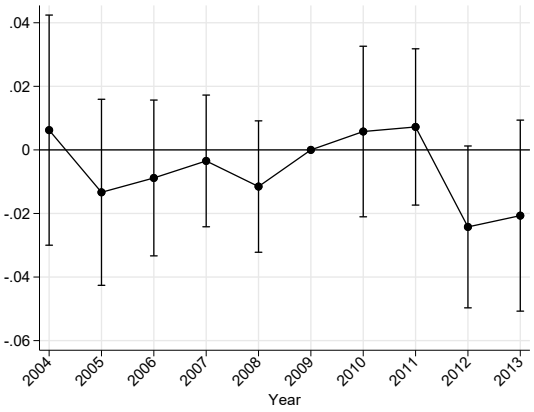
(f) Log(Hours Worked) by Urban and Rural



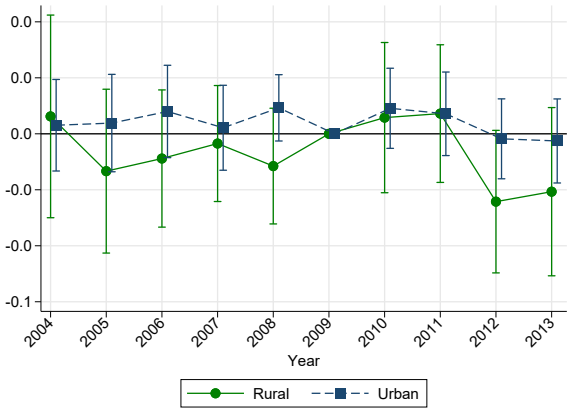
Notes. These figures present estimates at the individual level in a sample of children between five and 18 years of age. The estimations are performed using the Colombian household survey data from 2007 to 2018 which is gathered at the monthly level. The outcomes correspond to dummy variables taking the value of one if the individual is unemployed, if she is employed, and log of hours worked. Left panels include all individuals, whereas right panels present estimates separately by those living in urban and rural schools. All specifications include municipality and month-by-rural fixed effects, and control for gender, age, age squared, parents education, and household size. Standard errors clustered at the municipality level. 95 percent confidence intervals are displayed.

Figure A.6: Effects of Unusual Rain Disruption on Night-Time Luminosity

(a) Overall



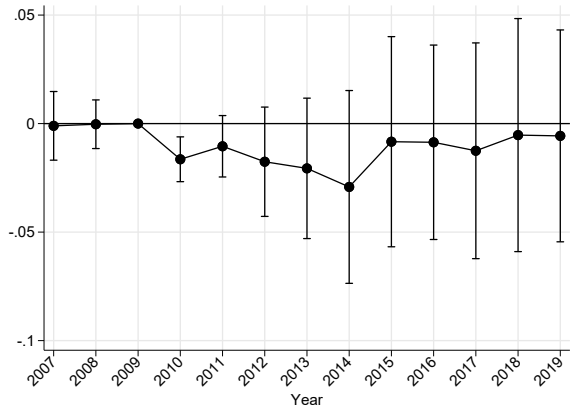
(b) Between Urban and Rural Schools



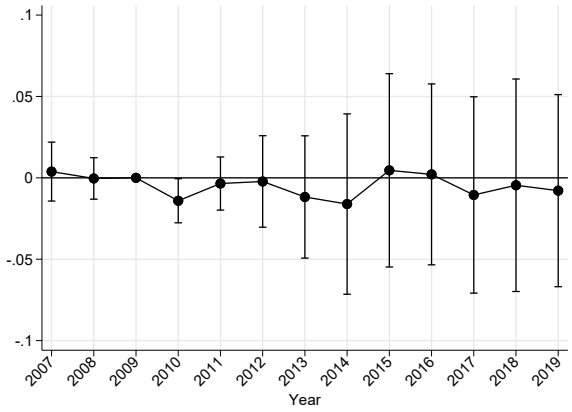
Notes. These figures present estimates of Equation 2 at the municipality level. The outcome corresponds to the log of the area-weighted average of night-time lights at the municipality level from the Defense Meteorological Satellite Program gathered from Li et al. (2022). It includes data from satellites F16 and F18, and the spatial resolution is of 30 arc-seconds. The left panel includes all municipalities ($N = 10,602$). The right panel presents estimates separately by urban ($N = 10,409$) and rural areas ($N = 10,602$) per municipality. All the estimations include year and municipality fixed effects, and standard errors clustered at the municipality level. 95 percent confidence intervals are displayed.

Figure A.7: Effects of Unusual Rain Disruption on Agricultural Production

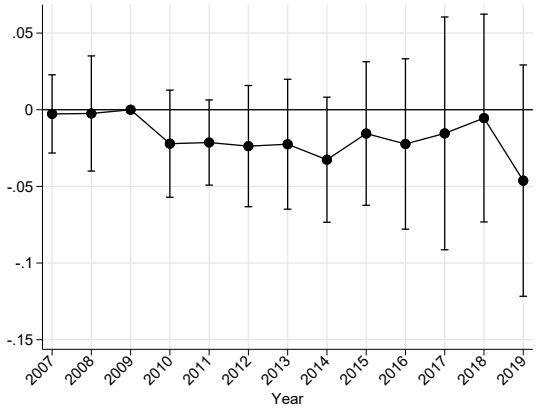
(a) Planted Area



(b) Harvested Area



(c) Production (Tons)



Notes. These figures present estimates of Equation (2) at the municipality level. Estimations performed using Poisson regression. The outcomes correspond to number of planted hectares in Panel A.7a, the number of harvested hectares in Panel A.7b, and to the volume of agricultural production (measured in tons) in Panel A.7c. All the estimations include year and municipality fixed effects, and standard errors clustered at the municipality level. 95 percent confidence intervals are displayed.

Table A.1: Descriptive Statistics

	Obs. (1)	Mean (2)	Stand. Dev. (3)	Median (4)	Max. (5)	Min. (6)
A) Municipality Shock						
Precipitation	832	5930.43	6426.89	3902.10	70251.30	45.40
Area Under Risk of Flooding (%)	832	0.12	0.23	0.00	1.00	0.00
Standardized Residuals (w_m^{2010})	832	0.00	1.00	-0.29	10.15	-1.29
B) Census of Schools						
Rural School (%)	653,101	0.68	0.47	1.00	1.00	0.00
Public School (%)	653,101	0.82	0.39	1.00	1.00	0.00
Pre-School (%)	653,101	0.90	0.30	1.00	1.00	0.00
Primary School (%)	653,101	0.93	0.25	1.00	1.00	0.00
Lower-Secondary School (%)	653,101	0.30	0.46	0.00	1.00	0.00
Upper-Secondary School (%)	653,101	0.28	0.45	0.00	1.00	0.00
Dropout Rate (%)	653,101	0.05	0.08	0.02	1.00	0.00
Approval Rate (%)	653,101	0.86	0.14	0.89	1.00	0.00
Failure Rate (%)	653,101	0.05	0.08	0.03	1.00	0.00
Transfer Rate (%)	653,101	0.04	0.07	0.00	1.00	0.00
Number of Students	653,101	205.49	382.49	53.00	8925.00	1.00
Number of Teachers	647,271	8.89	15.05	3.00	978.00	0.00
Teachers with tertiary education (%)	647,204	0.73	0.38	1.00	1.00	0.00
c) Test Score Measures						
Average Score (σ)	108,501	-0.00	0.73	-0.14	5.07	-2.76
Math Score (σ)	108,501	-0.02	0.60	-0.10	6.82	-2.49
Reading Score (σ)	108,501	-0.02	0.60	-0.08	4.48	-2.79
Nat. Sciences Score (σ)	108,501	0.00	0.62	-0.09	4.73	-3.06
Soc. Sciences Score (σ)	108,501	-0.01	0.57	-0.07	3.40	-2.84
English Score (σ)	108,501	0.02	0.76	-0.18	5.18	-5.59

Table A.2: Balance of the Weather Shock

	Dropout Rate (1)	Approval Rate (2)	Failure Rate (3)	Transfer Rate (4)	Number of Teachers (5)	Sh. Teachers Tert. Education (6)	Harvested Area (7)	Planted Area (8)	Agricultural Production (9)	Nighlight Luminosity (10)	Average Test Scores (11)
Weather Shock	0.007	0.001	-0.009	0.001	0.139	-0.031	0.532	0.462	-0.106	0.056	-0.174
	(0.024)	(0.039)	(0.024)	(0.016)	(0.225)	(0.080)	(0.748)	(0.609)	(0.833)	(0.405)	(0.204)
Observations	3,319	3,319	3,319	3,319	3,319	3,319	1,626	1,626	1,626	3,117	3,158
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State-Specific Trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table presents the results of estimating a linear regression of the weather shock on outcomes measured before 2010. The outcome is estimated in first differences, and includes year fixed effects, and state-specific trends. Standard errors are clustered at the municipality level. *** p<0.01, ** p<0.05, * p<0.1.

Table A.3: Robustness of the Effect to Alternative Definitions of the Weather Shock

	Dropout Rate		Approval Rate		Failure Rate	
	(1)	(2)	(3)	(4)	(5)	(6)
A) Controlling by Rain in Previous Years						
Weather*Post (β)	0.013**	-0.006	-0.001	0.001	0.010	-0.002
	(0.006)	(0.008)	(0.001)	(0.001)	(0.013)	(0.016)
Weather*Post*Rural (γ)		0.040**		-0.005**		0.024
		(0.018)		(0.002)		(0.020)
Rural ($\beta + \gamma$)		0.034		-0.004		0.022
p-value		0.006		0.043		0.214
B) Controlling by Predicted Flooding and Rain in Previous Years						
Weather*Post (β)	0.012**	-0.006	-0.001	0.001	0.010	-0.002
	(0.006)	(0.008)	(0.001)	(0.001)	(0.013)	(0.016)
Weather*Post*Rural (γ)		0.040**		-0.005**		0.023
		(0.018)		(0.002)		(0.020)
Rural ($\beta + \gamma$)		0.034		-0.004		0.021
p-value		0.007		0.044		0.231
Observations	652,497	652,458	652,497	652,494	652,497	652,450
Mean Dep. Var.	0.0527		0.856		0.0542	
School Controls	Yes	Yes	Yes	Yes	Yes	Yes
Municipality FE	Yes		Yes		Yes	
State Trends	Yes		Yes		Yes	
Year-By-Rural FE	Yes	Yes	Yes	Yes	Yes	Yes
Municip.-By-Rural FE		Yes		Yes		Yes
State-By-Rural Trends		Yes		Yes		Yes

Note: This table presents the results of the estimation of Equation (2) in a static fashion in odd columns and the estimation of Equation (3) in even columns. Panel A defines the weather shock as the residuals of the regression of rainfall in 2010 on rainfall from 1994-2009. Panel B defines the weather shock as the residuals of a regression of rainfall in 2010 on rainfall from 1994-2009 and predicted flooding. The outcomes correspond to dropout, approval, and failure rates. Every rate is computed as the ratio of the number of students in each situation divided by the total number of students. Estimations performed using Poisson regression. Estimations in odd columns include municipality fixed effects, year-by-rural fixed effects, and state-specific trends. Specifications in even columns include municipality-by-rural fixed effects, year-by-rural fixed effects, and state-by-rural trends. All specifications include a set of dummy variables capturing if the school offers primary-, secondary-, or middle-scool level education as school controls. Standard errors are clustered at the municipality level. *** p<0.01, ** p<0.05, * p<0.1.

Table A.4: Effects on Share of Students who Transfer School

	(1)	(2)
Weather*Post (β)	0.016	0.008
	(0.012)	(0.010)
Weather*Post*Rural (γ)		0.021
		(0.013)
Rural ($\beta + \gamma$)		0.029
p-value		0.109
Observations	653,101	653,011
Mean Dep. Var.	0.0373	
School Controls	Yes	Yes
Municipality FE	Yes	
State Trends	Yes	
Year-By-Rural FE	Yes	Yes
Municip.-By-Rural FE		Yes
State-By-Rural Trends		Yes

Note: This table presents the results of the estimation of Equation (2() in a static fashion in columns (1) and the estimation of Equation (3) in column (2). The outcome corresponds to the share of students who transfer school. Estimations performed using Poisson regression. The specification in column (1) includes municipality fixed effects, year-by-rural fixed effects, and state-specific trends. The specification in column (2) includes municipality-by-rural fixed effects, year-by-rural fixed effects, and state-by-rural trends. All specifications include a set of dummy variables capturing if the school offers pre-, primary-, secondary-, or middle-scool level education as school controls. Standard errors are clustered at the municipality level. *** p<0.01, ** p<0.05, * p<0.1.

Table A.5: Effects on Municipalities' Population

	Overall (1)	Urban (2)	Rural (3)	Difference (4)
Weather*Post (β)	-0.001	-0.005	0.043***	-0.005
	(0.002)	(0.003)	(0.010)	(0.003)
Affected*Post*Rural (γ)				0.048***
				(0.011)
Rural ($\beta + \gamma$)				0.043
p-value				0.000
Observations	1,662	1,644	1,662	3,306
Municipality FE	Yes	Yes	Yes	
Year FE	Yes	Yes	Yes	
Mean Dep. Var.	46417	36704	10110	
School Controls				Yes
Municip.-By-Rural FE				Yes
Year-By-Rural FE				Yes

Note: This table presents in columns 1-3 the results of the estimation of Equation (2() with two periods using the municipalities' population as outcome. Column 4 displays the result of estimating Equation (3). Estimations are performed using Poisson regression at the municipality level and include information for 2005 and 2018. Municipality and year fixed effects are included in the first three columns. Municipality-by-rural and year-by-rural fixed effects are included in column (4). Standard errors are clustered at the municipality level. *** p<0.01, ** p<0.05, * p<0.1.

Table A.6: No Differential Effects on School Resources by Urban and Rural Schools

	Number of Teachers		Teachers with Tertiary Educ. (%)		Schools in Municipality	
	(1)	(2)	(3)	(4)	(5)	(6)
Weather*Post (β)	-0.003	-0.004*	-0.001	-0.002	0.010	0.010
	(0.002)	(0.002)	(0.002)	(0.003)	(0.007)	(0.008)
Weather*Post*Rural (γ)		0.002		0.004		0.006
		(0.004)		(0.008)		(0.006)
Rural ($\beta + \gamma$)		-0.002		0.001		0.016
p-value		0.699		0.814		0.002
Observations	647,271	647,267	647,204	647,198	12,460	23,113
Mean Dep. Var.	8.479		0.728		45.26	
School Controls	Yes	Yes	Yes	Yes		
Municipality FE	Yes		Yes		Yes	
State Trends	Yes		Yes		Yes	
Year-By-Rural FE	Yes	Yes	Yes	Yes		Yes
Municip.-By-Rural FE		Yes		Yes		Yes
State-By-Rural Trends		Yes		Yes		Yes
Year FE					Yes	

Note: This table presents the results of the estimation of Equation (2) in a static fashion in odd columns and the estimation of Equation (3) in even columns. The outcomes correspond to the number of teachers per school, the share with tertiary education, and the total number of schools per municipality. Estimations performed using Poisson regression. Estimates in columns (1) to (4) are estimated at the school level, whereas estimates in column (5) are performed at the municipality level, and those in column (6) at the municipality-by-rural level. Estimations in columns (1) and (3) include school controls, municipality fixed effects, year-by-rural fixed effects, and state specific trends. Estimations in columns (2) and (4) include school controls, municipality-by-rural fixed effects,, year-by-rural fixed effects, and state-by-rural trends. Point estimates in column (5) include municipality and year fixed effects, and state-specific trends. Estimates in column (6) include municipality-by-rural fixed effects, year-by-rural fixed effects, and state-by-rural trends. School controls include set of dummy variables capturing if the school offers pre-, primary-, secondary-, or middle-scool level education. Standard errors are clustered at the municipality level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.