Supplementary Appendix

to the paper

Rain and the Democratic Window of Opportunity

by Markus Brückner and Antonio Ciccone

October 2009

downloadable from: www.antociccone.eu

Table of Contents

Table 1. First Stage Log-Level and First-Difference Estimation

	Log GDP	ΔLog GDP
	(1)	(2)
	LS	LS
Rainfall, t	0.875***	
	(0.328)	
Rainfall, t-1	0.944**	
	(0.399)	
ΔLog Rainfall, t		0.058***
		(0.016)
ΔLog Rainfall, t-1		0.042***
		(0.015)
Country Fixed Effect	Yes	Yes
Country Time Trend	Yes	No
Common Time Effect	Yes	Yes
Observations	955	955

Note: The method of estimation is least squares; Huber robust standard errors in parentheses are clustered at the country level. The dependent variable in column (1) is the log of real per capita GDP; in column (2) the dependent variable is the first difference of the log of real per capita GDP. Rainfall units are in 100mm per year. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 2. Controlling for Temperature

	Log GDP	ΔPolity2	
	(1)	(2)	(3)
	LS	LS	LS
Log Rainfall, t	0.078***	0.361	0.100
	(0.028)	(0.354)	(0.402)
Log Rainfall, t-1	0.054*	-1.209*	-1.440*
	(0.032)	(0.727)	(0.745)
Temperature, t	0.007	0.367	0.323
	(0.016)	(0.252)	(0.262)
Temperature, t-1	0.009	0.267	0.198
	(0.022)	(0.277)	(0.253)
Country Fixed Effect	Yes	Yes	Yes
Country Time Trend	Yes	Yes	Yes
Common Time Effect	Yes	Yes	Yes
Observations	955	955	902

Note: The method of estimation is least squares; Huber robust standard errors in parentheses are clustered at the country level. The dependent variable in column (1) is the log of real per capita GDP; in column (2) the dependent variable is the t to $t+1$ change in the revised combined Polity score (*Polity2*); column (3) excludes observations that correspond to interregnum periods. Rainfall data are from GPCP (Adler et al. 2003); temperature data from Matsuura and Willmott (2007). The Matsuura and Willmott data contain temperature estimates on a 0.5x0.5 degree latitude/longitude grid. We obtain country-level temperature as the average of the estimates corresponding to grid points within countries' borders. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 3. Non-Linearities

Log GDP

Panel A: 80th, 90th, 95th Percentile

	Country Specific Rainfall Dummies			Global Rainfall Dummies		
	(1)	(2)	(3)	(4)	(5)	(6)
	LS	LS	LS	LS	LS	LS
Log Rainfall, t	0.087***	0.079**	0.091***	0.093**	0.075**	0.063**
	(0.029)	(0.034)	(0.029)	(0.037)	(0.031)	(0.030)
Above 95th Percentile Dummy	-0.016 (0.018)			-0.017 (0.018)		
Above 90th Percentile Dummy		0.001 (0.015)			0.003 (0.012)	
Above 80th Percentile Dummy			-0.007 (0.011)			0.008 (0.012)

Panel B: 5th, 10th, 20th Percentile

	Country Specific Rainfall Dummies			Global Rainfall Dummies		
	(1)	(2)	(3)	(4)	(5)	(6)
	LS	LS	LS	LS	LS	LS
Log Rainfall, t	0.075***	0.073***	0.082**	0.084**	0.086**	0.067*
	(0.028)	(0.030)	(0.038)	(0.032)	(0.037)	(0.038)
Below 5th Percentile Dummy	-0.009 (0.023)			0.006 (0.017)		
Below 10th Percentile Dummy		-0.007 (0.013)			0.005 (0.012)	
Below 20th Percentile Dummy			0.002 (0.012)			-0.006 (0.009)
Observations	955	955	955	955	955	955

Note: The dependent variable is the log of real per capita GDP. Huber robust standard errors are clustered at the country level. The dummy variables in Panel A are indicator functions that are equal to unity if and only if rainfall is above the 95th/90th/80th percentile of the rainfall distribution; in Panel B dummy variables are indicator functions that are equal to unity if and only if rainfall is below the 5th/10th/20th percentile of the rainfall distribution. Columns (1)-(3) refer to the percentiles of the country-specific rainfall distribution of yearly rainfall levels, while columns (4)-(6) refer to the percentiles of the distribution of yearly rainfall levels across all Sub-Saharan African countries. All regressions control for country fixed effects, country-specific time trends, and year fixed effects. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 4. Excluding Top 1 Percent of Rainfall

	Log GDP	ΔPolity2	
	(1)	(2)	(3)
	LS	LS	LS
Log Rainfall, t	0.086***	0.245	0.007
	(0.029)	(0.345)	(0.375)
Log Rainfall, t-1	0.041	-1.174**	-1.345**
	(0.033)	(0.560)	(0.562)
Country Fixed Effect	Yes	Yes	Yes
Country Time Trend	Yes	Yes	Yes
Common Time Effect	Yes	Yes	Yes
Observations	945	945	893

Note: The method of estimation is least squares; Huber robust standard errors in parentheses are clustered at the country level. The regressions are for the sample excluding the top 1 percent of rainfall observations. The dependent variable in column (1) is the log of real per capita GDP; in column (2) the dependent variable is the *t* to *t*+1 change in the revised combined Polity score (*Polity2*); column (3) excludes observations that correspond to interregnum periods. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 5. Spatial Correlation

	Log GDP	ΔPolity2	
	(1)	(2)	(3)
	LS	LS	LS
Log Rainfall, t	0.077**	0.539	0.395
	(0.033)	(0.429)	(0.473)
Log Rainfall, t-1	0.036	-1.701**	-1.974**
	(0.033)	(0.766)	(0.760)
Log Rainfall of Neighbors, t	0.011	-0.680	-0.914
	(0.031)	(0.725)	(0.789)
Log Rainfall of Neighbors, t-1	0.037	0.633	0.822
	(0.037)	(0.771)	(0.828)
Country Fixed Effect	Yes	Yes	Yes
Country Time Trend	Yes	Yes	Yes
Common Time Effect	Yes	Yes	Yes
Observations	955	955	902

Note: The method of estimation is least squares; Huber robust standard errors in parentheses are clustered at the country level. The dependent variable in column (1) is the log of real per capita GDP; in column (2) the dependent variable is the *t* to *t*+1 change in the revised combined Polity score (*Polity2*); column (3) excludes observations that correspond to interregnum periods. *Rainfall of Neighbors* is the average amount of rainfall in bordering countries. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 6. Alternative Estimation of Standard Errors

Panel A: Log GDP

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	HAC BW(2)	HAC BW(4)	HAC BW(24)	FGLS AR(1)	Country Cluster	Bootstrap	Year Cluster	CGM (2007)	DK (1998)
Log Rainfall, t	0.075*** (0.023)	0.075*** (0.023)	0.075*** (0.026)	0.068*** (0.016)	0.075*** (0.026)	0.075*** (0.026)	0.075*** (0.023)	0.075*** (0.028)	0.075*** (0.019)
Log Rainfall, t-1	0.048** (0.023)	0.048** (0.023)	0.048* (0.029)	0.048*** (0.016)	0.048 (0.032)	0.048 (0.030)	0.048** (0.019)	0.048 (0.032)	0.048*** (0.013)
Observations	955	955	955	955	955	955	955	955	955

Panel B: ΔPolity2

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	HAC BW(2)	HAC BW(4)	HAC BW(24)	FGLS AR(1)	Country Cluster	Bootstrap	Year Cluster	CGM (2007)	DK (1998)
Log Rainfall, t	0.261 (0.384)	0.261 (0.380)	0.261 (0.363)	0.265 (0.421)	0.261 (0.347)	0.261 (0.355)	0.261 (0.342)	0.261 (0.327)	0.261 (0.394)
Log Rainfall, t-1	-1.461** (0.588)	-1.461** (0.603)	-1.461** (0.708)	-1.391*** (0.430)	-1.461** (0.723)	-1.461** (0.739)	-1.461*** (0.459)	-1.461** (0.675)	-1.461*** (0.314)
Observations	955	955	955	955	955	955	955	955	955

Panel C: Adjusted ΔPolity2

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	HAC BW(2)	HAC BW(4)	HAC BW(24)	FGLS AR(1)	Country Cluster	Bootstrap	Year Cluster	CGM (2007)	DK (1998)
Log Rainfall, t	0.031 (0.406)	0.031 (0.405)	0.031 (0.394)	0.008 (0.400)	0.031 (0.381)	0.031 (0.389)	0.031 (0.383)	0.031 (0.396)	0.031 (0.466)
Log Rainfall, t-1	-1.660*** (0.615)	-1.660** (0.631)	-1.660** (0.734)	-1.744*** (0.452)	-1.660** (0.740)	-1.660** (0.751)	-1.660*** (0.509)	-1.660** (0.718)	-1.660*** (0.369)
Observations	902	902	902	902	902	902	902	902	902

Note: The dependent variable in Panel A is the log of real per capita GDP; in Panel B the t to $t+1$ change in the revised combined Polity score; Panel C excludes observations that correspond to interregnum periods. Standard errors are listed in parentheses. All regressions control for country fixed effects, country-specific time trends, and year fixed effects. Columns (1)-(3) compute heteroskedasticity and autocorrelation consistent standard errors based on the Newey-West estimator with a bandwidth of 2 (column (1)), 4 (column (2)), and 24 (column (3)); column (4) computes FGLS standard errors assuming country-specific AR(1) serial correlation; column (5) computes Huber robust standard errors that are clustered at the country level; column (6) computes standard errors using the block-bootstrap; column (7) computes Huber robust standard errors that are clustered at the year level; column (8) computes Huber robust standard errors that are clustered at the country and year level using the Cameron, Gelbach, and Miller (*Robust Inference with Multi-Way Clustering*, 2006, NBER Technical Paper No. T0327) multi-cluster estimator; column (9) computes standard errors that are robust to arbitrary spatial correlation using the Driscoll and Kraay (*Consistent Estimation of Covariance Matrix Estimation with Spatially Dependent Panel Data*, 1998, Review of Economics and Statistics) estimator. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 7. Matsuura and Willmott Rainfall Data

Time Period:	1980-2004	1960-1980	1960-1990	Independence-1980	Independence-1990
	Panel A: First Stage Per Capita GDP				
	(1)	(2)	(3)	(4)	(5)
	LS	LS	LS	LS	LS
Log Rainfall, t	-0.007	0.085***	0.059**	0.084***	0.073**
	(-0.021)	(0.021)	(0.028)	(0.019)	(0.029)
Log Rainfall, t-1	-0.022	0.092***	0.049	0.083***	0.051
	(-0.030)	(0.030)	(0.037)	(0.034)	(0.039)
Observations	955	683	1083	624	1024
	Panel B: Reduced Form ΔPolity2				
	(1)	(2)	(3)	(4)	(5)
	LS	LS	LS	LS	LS
Log Rainfall, t	0.166	-0.990*	-0.736**	-0.852	-0.683**
	(0.277)	(0.542)	(0.344)	(0.548)	(0.324)
Log Rainfall, t-1	-1.325*	-0.121	-0.379	-0.203	-0.443
	(0.735)	(0.548)	(0.353)	(0.523)	(0.360)
Observations	955	689	1089	720	1120
	Panel C: Reduced Form Adjusted ΔPolity2				
	(1)	(2)	(3)	(4)	(5)
	LS	LS	LS	LS	LS
Log Rainfall, t	0.126	-1.044**	-0.749**	-0.904*	-0.688**
	(0.292)	(0.525)	(0.345)	(0.536)	(0.326)
Log Rainfall, t-1	-1.207	-0.138	-0.340	-0.221	-0.399
	(0.786)	(0.523)	(0.360)	(0.518)	(0.363)
Observations	902	682	1075	713	1106

Note: The method of estimation is least squares; Huber robust standard errors (in parentheses) are clustered at the country level. Rainfall data are from Matsuura and Willmott (2007). The Matsuura and Willmott data contain rainfall estimates on a 0.5x0.5 degree latitude/longitude grid. We obtain country-level rainfall as the average of the estimates corresponding to grid points within countries' borders. All regressions control for country fixed effects, country-specific time trends, and year fixed effects. The dependent variable in Panel A is the log of real per capita GDP; in Panel B the t to $t+1$ change in the revised combined Polity score; Panel C excludes observations that correspond to interregnum periods. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 8. The Effect of Rainfall on Government (Military) Expenditures and Consumer Prices

	ΔGovernment Expenditure		ΔMilitary Expenditure		ΔConsumer Prices	
	(1)	(2)	(3)	(4)	(5)	(6)
	LS	SYS-GMM	LS	SYS-GMM	LS	SYS-GMM
Log Rainfall, t	-0.006	0.011	-0.016	-0.089	-0.069	-0.079
	(0.035)	(0.048)	(0.084)	(0.079)	(0.073)	(0.073)
Log Rainfall, t-1	0.029	0.019	0.106	0.016	0.059	0.023
	(0.029)	(0.045)	(0.135)	(0.105)	(0.061)	(0.055)
Log Government Expenditure, t-1		-0.449***				
		(0.028)				
Log Military Expenditure, t-1				-0.682***		
				(0.149)		
Log Consumer Price, t-1						-0.334***
						(0.037)
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Country Time Trend	Yes	Yes	Yes	Yes	Yes	Yes
Common Time Effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	936	936	431	431	936	936

Note: The method of estimation in columns (1), (3), and (5) is least squares; columns (2), (4) and (6) SYS-GMM (Blundell-Bond). Huber robust standard errors (in parentheses) are clustered at the country level. The dependent variable in columns (1) and (2) is the log change in government expenditure; in columns (3) and (4) the dependent variable is the log change in military expenditure; in columns (5) and (6) the log change in consumer prices. Government expenditure data and consumer price data are from PWT 6.2; data on military expenditure are from WDI (2009). *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 9. Freedom House Political Rights Indicator

	ΔPolitical Rights						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	LS	2SLS	2SLS	LS	SYS-GMM	2SLS	2SLS
Log Rainfall, t	0.042 (0.135)			0.044 (0.129)	0.113 (0.143)		
Log Rainfall, t-1	-0.190 (0.142)			-0.135 (0.151)	-0.094 (0.147)		
Log Rainfall, t-2	-0.300** (0.143)			-0.334** (0.151)	-0.283* (0.147)		
Log GDP, t-2		-4.446** [0.024]				-4.827*** [0.007]	
Country Specific Recession, t-2			0.863** [0.024]				0.943*** [0.007]
Political Rights, t				-0.355*** (0.030)	-0.342*** (0.043)	-0.333*** [0.000]	-0.356*** [0.000]
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Common Time Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	956	956	956	956	956	956	956

Note: The method of estimation in columns (1) and (4) is least squares, column (5) system-GMM (Blundell-Bond), and columns (2), (3), (6), and (7) two-stage least squares; below least squares estimates we report Huber robust standard errors (in parentheses) clustered at the country level; below the two-stage least squares estimates we report p-values [in square brackets] based on the Anderson-Rubin test of statistical significance. A key property of this test is that it is robust to weak instruments; 2SLS standard errors are not robust to weak instruments, and inference based on 2SLS can be very misleading as a result. See Andrews and Stock (2005) for a review of these issues. We implement a version of the Anderson-Rubin test that is robust to heteroskedasticity and arbitrary within-country correlation of the residuals. The FH political rights index has a [1,7] range with higher values indicating lower political rights. In the case of the Polity score, higher values denote greater political rights. To make results more easily comparable, we therefore use the negative of the *t* to *t*+1 change in the FH political rights index so that positive changes denote more political rights and negative changes less political rights. Given the [-10,+10] range of the Polity score, the FH estimates in the table should be multiplied by 3 before comparing them to the Polity estimates (this yields FH estimates that are about 60 percent of the corresponding Polity estimates). *Country Specific Recession* is an indicator variable that is unity if and only if per capita GDP falls below the country-specific time trend for reasons other than shocks affecting all Sub-Saharan countries (see equation (3) in the main text). *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 10. Second Stage with Income Shocks in *t* and *t*-1

	Δ POLITY2		ΔEXCONST	ΔPOLCOMP	ΔEXREC
	Panel A: Per Capita GDP, t and t-1				
	(1)	(2)	(3)	(4)	(5)
	2SLS	2SLS	2SLS	2SLS	2SLS
Log GDP, t	5.389	2.493	2.122	-1.907	2.113
	(7.878)	(8.355)	(2.569)	(3.049)	(3.264)
Log GDP, t-1	-22.482*	-23.499*	-7.587	-6.083	-7.907*
	(11.746)	(13.160)	(4.860)	(4.824)	(4.545)
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes
Country Time Trend	Yes	Yes	Yes	Yes	Yes
Common Time Effect	Yes	Yes	Yes	Yes	Yes
Observations	955	902	902	902	902
	Panel B: Country Specific Recession, t and t-1				
	(1)	(2)	(3)	(4)	(5)
	2SLS	2SLS	2SLS	2SLS	2SLS
Country Specific Recession, t	-2.897	-2.102	-0.880	-0.153	-0.903
	(2.210)	(2.160)	(0.764)	(0.737)	(0.869)
Country Specific Recession, t-1	5.331**	5.423**	1.657	1.586	1.734*
	(2.453)	(2.478)	(0.849)	(0.995)	(0.892)
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes
Country Time Trend	Yes	Yes	Yes	Yes	Yes
Common Time Effect	Yes	Yes	Yes	Yes	Yes
Observations	955	902	902	902	902

Note: The method of estimation is two-stage least squares; Huber robust standard errors (shown in parentheses) are clustered at the country level. The 2SLS regressions use rainfall as an instrument for income. The dependent variable in column (1) is the *t* to *t*+1 change in the revised combined Polity score (*Polity2*); column (2) excludes observations that correspond to interregnum periods. The dependent variable in columns (3)-(5) is the *t* to *t*+1 change in Polity IV sub-scores of constraints on the executive (*EXCONST*), political competition (*POLCOMP*), and executive recruitment (*EXREC*). The range of the dependent variables is as follows: *Polity2* [-10,10], *EXCONST* [1,7], *POLCOMP* [1,10], and *EXREC* [1,8]. *Country Specific Recession* is an indicator variable that is unity if and only if per capita GDP falls below the country specific time trend for reasons other than shocks affecting all Sub-Saharan countries (see equation (3) in the main text). *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 11. Second Stage with Income Shocks in *t*

	Δ Polity2		ΔExconst	ΔPolcomp	ΔExrec
			Panel A: Per Capita GDP, t		
	(1)	(2)	(3)	(4)	(5)
	2SLS	2SLS	2SLS	2SLS	2SLS
Log GDP, t	1.499	-1.994	0.673	-3.068	0.604
	[0.781]	[0.716]	[0.645]	[0.155]	[0.808]
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes
Country Time Trend	Yes	Yes	Yes	Yes	Yes
Common Time Effect	Yes	Yes	Yes	Yes	Yes
Observations	955	902	902	902	902
			Panel B: Country Specific Recession, t		
	(1)	(2)	(3)	(4)	(5)
	2SLS	2SLS	2SLS	2SLS	2SLS
Country Specific Recession, t	-0.285	0.370	-0.125	0.570	-0.112
	[0.781]	[0.716]	[0.645]	[0.155]	[0.808]
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes
Country Time Trend	Yes	Yes	Yes	Yes	Yes
Common Time Effect	Yes	Yes	Yes	Yes	Yes
Observations	955	902	902	902	902

Note: The method of estimation is two-stage least squares; the instrumental variable is rainfall. Below the two-stage least squares estimates we report p-values [in square brackets] based on the Anderson-Rubin test of statistical significance. A key property of this test is that it is robust to weak instruments; 2SLS standard errors are not robust to weak instruments, and inference based on 2SLS can be very misleading as a result. See Andrews and Stock (2005) for a review of these issues. We implement a version of the Anderson-Rubin test that is robust to heteroskedasticity and arbitrary within-country correlation of the residuals. The dependent variable in column (1) is the *t* to *t+1* change in the revised combined Polity score (*Polity2*); column (2) excludes observations that correspond to interregnum periods. The dependent variable in columns (3)-(5) is the *t* to *t+1* change in Polity IV sub-scores of constraints on the executive (*Exconst*), political competition (*Polcomp*), and executive recruitment (*Exrec*). The range of the dependent variables is as follows: *Polity2* [-10,10], *Exconst* [1,7], *Polcomp* [1,10], and *Exrec* [1,8]. *Country Specific Recession* is an indicator variable that is unity if and only if per capita GDP falls below the country-specific time trend for reasons other than shocks affecting all Sub-Saharan countries (see equation (3) in the main text). *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 12. Dynamic Panel Estimates

	(1)	(2)	(3)	(4)	(5)
Panel A: Per Capita GDP					
	LS	LS	LS	SYS-GMM	SYS-GMM
Log Rainfall, t	0.075***	0.061***	0.062***	0.065***	0.061***
	(0.026)	(0.017)	(0.017)	(0.019)	(0.019)
Log Rainfall, t-1	0.048	0.004	0.003	0.013	0.007
	(0.032)	(0.021)	(0.021)	(0.020)	(0.020)
Log GDP, t-1		0.635***	0.655***	0.550***	0.583***
		(0.033)	(0.046)	(0.013)	(0.051)
Log GDP, t-2			-0.029		-0.029
			(0.040)		(0.042)
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes
Country Time Trend	Yes	Yes	Yes	Yes	Yes
Common Time Effect	Yes	Yes	Yes	Yes	Yes
Observations	955	955	955	955	955
Panel B: ΔPolity2					
	(1)	(2)	(3)	(4)	(5)
	LS	LS	LS	SYS-GMM	SYS-GMM
Log Rainfall, t	0.261	0.213	0.169	-0.024	-0.275
	(0.347)	(0.317)	(0.296)	(0.387)	(0.392)
Log Rainfall, t-1	-1.461**	-1.401**	-1.403**	-1.486**	-1.659**
	(0.723)	(0.690)	(0.661)	(0.738)	(0.737)
Polity2, t		-0.294***	-0.174***	-0.359***	-0.255***
		(0.023)	(0.034)	(0.037)	(0.041)
Polity2, t-1			-0.171***		-0.154***
			(0.025)		(0.031)
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes
Country Time Trend	Yes	Yes	Yes	Yes	Yes
Common Time Effect	Yes	Yes	Yes	Yes	Yes
Observations	955	955	955	955	955

Note: The method of estimation in columns (1)-(3) is least squares, in columns (4) and (5) system-GMM (Blundell-Bond). Huber robust standard errors (in parentheses) are clustered at the country level. The dependent variable in Panel A is the log of real per capita GDP; in Panel B the t to $t+1$ change in the revised combined Polity score. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 13. Polity Level Estimates

				Polity2				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	LS	SYS-GMM	LS	SYS-GMM	LS	SYS-GMM	LS	SYS-GMM
Polity2, t	0.706***	0.641***	0.826***	0.746***	0.728***	0.637***	0.860***	0.769***
	(0.023)	(0.037)	(0.034)	(0.041)	(0.022)	(0.031)	(0.030)	(0.033)
Polity2, t-1			-0.171***	-0.154***			-0.185***	-0.170***
			(0.025)	(0.031)			(0.026)	(0.030)
Log Rainfall, t	0.213	-0.024	0.169	-0.275	0.053	0.236	-0.016	-0.034
	(0.317)	(0.387)	(0.296)	(0.392)	(0.346)	(0.371)	(0.326)	(0.365)
Log Rainfall, t-1	-1.401**	-1.486**	-1.403**	-1.649**	-1.665**	-1.524**	-1.612**	-1.667**
	(0.690)	(0.738)	(0.661)	(0.737)	(0.701)	(0.746)	(0.671)	(0.724)
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Common Time Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	955	955	955	955	902	902	902	902

Note: The dependent variable is the revised combined Polity score in $t+1$; columns (5)-(8) exclude observations that correspond to interregnum periods. The method of estimation in columns (1), (3), (5), and (7) is least squares; columns (2), (4), (6), and (8) SYS-GMM (Blundell-Bond). Huber robust standards errors (in parentheses) are clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 14. Year-to-Year Rainfall Growth and Democratic Change

	ΔPolity2		ΔExconst	ΔPolcomp	ΔExrec	Democratic Transition	Democratic Step
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	LS	LS	LS	LS	LS	LS	LS
Rainfall Growth, t	0.586**	0.470	0.195	0.032	0.230	0.059	0.067**
	(0.293)	(0.330)	(0.125)	(0.137)	(0.149)	(0.036)	(0.030)
Rainfall Growth, t-1	-0.628	-0.836*	-0.180	-0.404**	-0.125	-0.040	-0.026
	(0.466)	(0.459)	(0.134)	(0.197)	(0.202)	(0.035)	(0.031)
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Common Time Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	955	902	902	902	902	700	867

Note: The method of estimation is least squares, standard errors (in parentheses) are clustered at the country level. The dependent variable in column (1) is the t to $t+1$ change in the revised combined Polity score (*Polity2*); column (2) excludes observations that correspond to interregnum periods. The dependent variable in columns (3)-(5) is the t to $t+1$ change in Polity IV sub-scores that reflect changes in a country's constraints on the executive (*Exconst*), political competition (*Polcomp*), and executive recruitment (*Exrec*). The range of the dependent variables is as follows: *Polity2* [-10,10], *Exconst* [1,7], *Polcomp* [1,10], and *Exrec* [1,8]. The dependent variable in column (6) is a *Democratic Transition Indicator* that is equal to unity in year t if and only if the country is a democracy in t but a non-democracy in t-1 (the year t indicator is not defined if the country is a democracy in t-1); in column (7) the dependent variable is a *Democratization Step Indicator* that is equal to unity in year t if and only if the country is upgraded to either a partial or full democracy between t-1 and t (the year t indicator is not defined if the country is a full democracy in t-1). Rainfall growth in t is calculated as logRain in t minus logRain in t-1 and therefore denotes the growth rate of rainfall between t and t-1 in log points. Rainfall growth in t-1 is calculated as logRain in t-1 minus logRain in t-2 and therefore denotes the growth rate of rainfall between t-1 and t-2 in log points. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 15. Rainfall and Value Added in the Agricultural Sector

	Log Agricultural GDP			
	(1)	(2)	(3)	(4)
	LS	LS	LS	LS
Log Rainfall, t	0.205***	0.195***	0.198***	0.188***
	(0.052)	(0.049)	(0.050)	(0.051)
Log Rainfall, t-1		0.128***	0.122***	0.124***
		(0.045)	(0.042)	(0.042)
Log Rainfall, t-2			0.071	
			(0.064)	
Log Rainfall, t* Polity2, t				-0.002
				(0.003)
Polity2, t				-0.001
				(0.003)
Log Rainfall, t-1* Polity2, t-1				0.010
				(0.021)
Polity2, t-1				0.002
				(0.019)
Country Fixed Effect	Yes	Yes	Yes	Yes
Country Time Trend	Yes	Yes	Yes	Yes
Common Time Effect	Yes	Yes	Yes	Yes
Observations	814	814	814	814

Note: The method of estimation is least squares; Huber robust standard errors (in parentheses) are clustered at the country level. The dependent variable is the log of agricultural GDP, calculated as the log of the share of agricultural value added in GDP (from WDI, 2009) plus the log of real GDP (from PWT 6.2). *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.
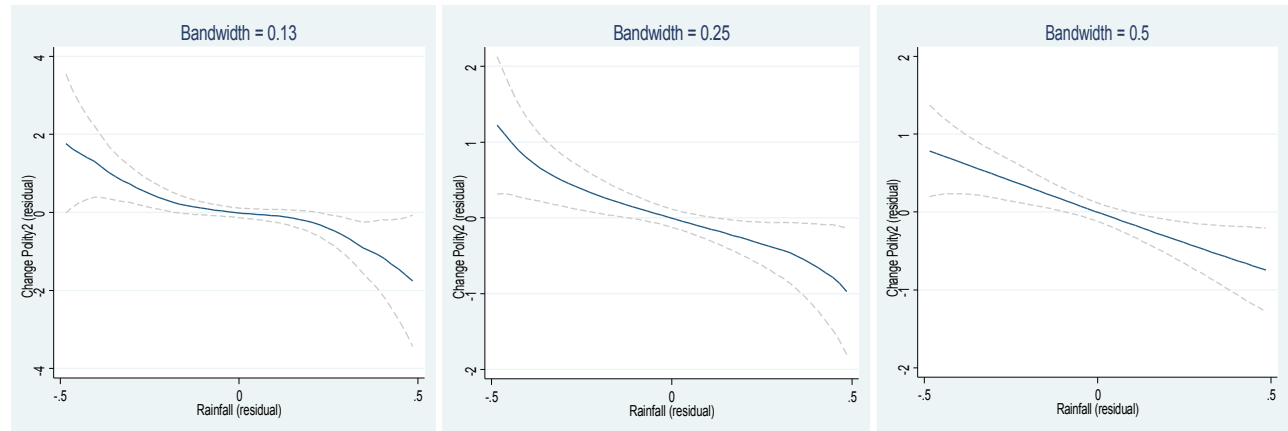
Figure 1. Non-Parametric Local Polynomial Estimates with Alternative Bandwidths

Figure 1A. Rainfall and Per Capita GDP
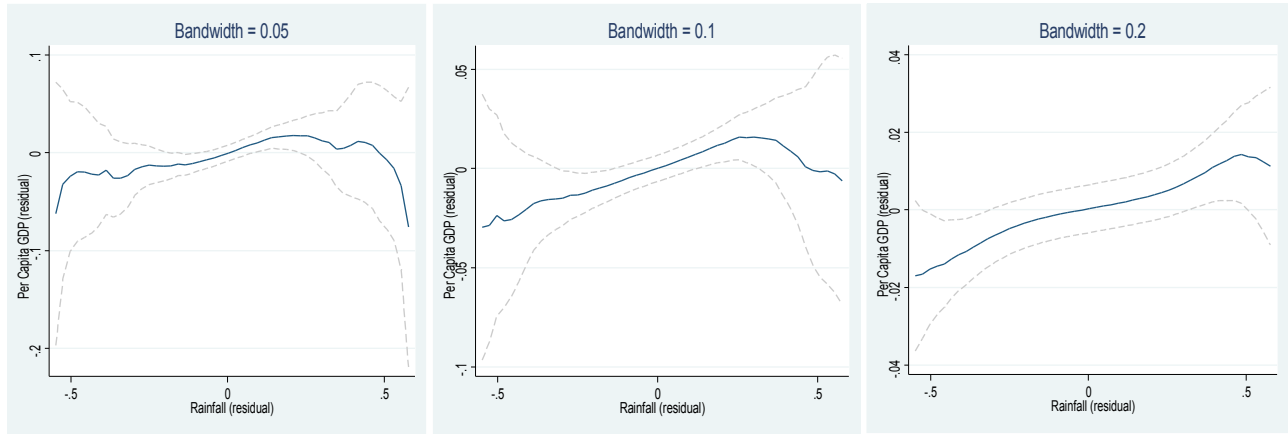
Note: Non-parametric local polynomial estimates are computed using an Epanechnikov kernel. Dashed lines indicate 95 percent confidence bands. The graph in the middle uses the bandwidth suggested by cross-validation criteria.

Figure 1B. Rainfall and Polity Change

Note: Non-parametric local polynomial estimates are computed using an Epanechnikov kernel. Dashed lines indicate 95 percent confidence bands. The graph in the middle uses the bandwidth suggested by cross-validation criteria.