Transitory Economic Shocks and Civil Conflict

by

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Abstract

To determine the effect of shocks on civil conflict, it is critical to tailor the empirical approach to the persistence of shocks. I illustrate my point by revisiting a cornerstone of the literature on the economics of civil conflict, Miguel, Satyanath, and Sergenti's (2004) study of rainfall and civil conflict in Sub-Saharan Africa. I find their approach to be inappropriate and their conclusions to be incorrect. For example, they conclude that higher rainfall levels are associated with significantly less civil conflict. I show that higher rainfall levels are actually associated with significantly more (not less) conflict in their data.

Key words: Transitory shocks, mean reversion, rainfall, conflict

JEL codes: O0, P0, Q0

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Does poor economic performance cause violent civil conflict? Collier and Hoeffler's (1998, 2004) and Fearon and Laitin's (2003) empirical work suggests this is the case. Their findings are not based on exogenous changes in the economic environment however, and could reflect feedback from conflict to economic performance or omitted social and political factors. To address these concerns, Miguel, Satyanath, and Sergenti (MSS, 2004) examine the link between (exogenous) rainfall and civil conflict in Sub-Saharan Africa. Their empirics lead them to the conclusion that *higher levels of rainfall are associated with significantly less conflict* (MSS, p.737; also p.745). MSS explain this association by negative rainfall shocks reducing incomes and thereby increasing conflict risk. Their methodology has quickly rendered their conclusions a cornerstone of the literature on the economics of civil conflict (e.g. Collier and Hoeffler, 2005; Collier, Hoeffler, and Rohner, 2009; Hegre and Sambanis, 2006; Fisman and Miguel, 2009).[1]

A point overlooked by the literature is that to determine the effect of shocks on civil conflict, it is critical to tailor the empirical approach to the persistence of shocks.[2] I illustrate my point by revisiting MSS's study. I find their approach to be inappropriate and their conclusions to be incorrect.[3] Higher rainfall levels are actually associated with significantly more (not less) conflict in MSS's data, and negative rainfall shocks reduce (rather than increase) conflict risk.

To see why understanding the persistence of shocks is critical for drawing the correct conclusions, consider MSS's conclusion that higher rainfall levels are associated with significantly less conflict. This conclusion is based on their finding that civil conflict is more

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[1] Although recent, MSS's study is the 12th most cited of more than 8800 journal articles on the topics *civil conflict* or *civil war* in history, economics, political sciences, or sociology according to the ISI Web of Knowledge http://isiwebofknowledge.com/.

[2] For example, there is no mention of this issue in Blattman and Miguel's (2010) survey.

[3] Burke, Miguel, Satyanath, Dykema, and Lobell's (2009) investigation of the effect of weather shocks on civil war risk in Africa adopts my empirical approach instead of MSS's approach.

likely following low year-on-year rainfall growth (MSS p.737) and their assumption that rainfall growth is a measure of rainfall shocks (MSS, p.733). But because rainfall levels are strongly mean reverting, low growth need not reflect that current rainfall levels are low. Instead, low growth may reflect mean reversion following high rainfall levels. MSS's approach can therefore lead to the conclusion that higher rainfall levels are associated with less conflict when higher rainfall levels are actually followed by more conflict. I find this to be the case in MSS's data.

Estimating the effect of income shocks on civil conflict using an instrumental-variables approach is also trickier than currently recognized by the literature. The appropriate approach depends on the persistence of those income shocks that are explained by the instrument. For example, theoretically, rainfall shocks can have transitory or permanent effects on income. Empirically, the effect turns out to be transitory, which allows using rainfall as an instrument for transitory, but not permanent, income shocks. I describe a two-step instrumental-variables approach and illustrate it by returning to MSS's study. MSS's approach leads them to the conclusion that negative economic shocks increase conflict. My approach yields that if anything, negative economic shocks reduce conflict. Conclusions differ because my approach takes into account that rainfall shocks have a transitory effect on income.

I also estimate the effect of rainfall shocks and transitory income shocks on civil conflict using the latest (corrected and extended) data. These data point towards conflict following negative rainfall shocks (in contrast to MSS's data). Instrumental-variables estimates do not yield a robust link between transitory income shocks and conflict however.

The remainder of the paper is organized as follows. Section I discusses the main empirical issues. Section II.A and II.B estimate the effects of rainfall shocks and transitory economic shocks on civil conflict using MSS's data. Section II.C reports on the link between rainfall shocks, income shocks, and civil conflict in the latest data. Section III concludes.

I. Empirical Issues

I first discuss estimation of the effect of rainfall shocks on the probability of civil conflict. In particular I demonstrate that using year-on-year rainfall growth as an explanatory variable can yield erroneous conclusions. I then show how to estimate the effect of transitory income shocks on conflict with a two-step instrumental-variables approach.

I.A. Rainfall Shocks, Rainfall Growth, and Civil Conflict

Empirically, rainfall levels are strongly mean reverting. For example, regressing log rainfall levels on lagged log rainfall levels controlling for country-specific fixed effects, yields a coefficient on lagged log rainfall of 0.17 using MSS's data.[4] To put it differently, following a positive rainfall shock of 10%, expected year-on-year rainfall growth is -8.3%. For simplicity, the theoretical results derived in the remainder of this section assume that rainfall levels are distributed identically and independently over time.[5] Also, following MSS, I focus on linear probability models of the link between civil conflict and rainfall.[6]

Suppose that the probability of conflict depends on current and lagged log rainfall levels,

$$Pconflict_t = \alpha_0 \log R_t + \alpha_1 \log R_{t-1} + \alpha_2 \log R_{t-2} . \quad (1)$$

If $\alpha_i > 0$, higher rainfall at $t-i$ increases the probability of conflict at *t*. If $\alpha_i < 0$, higher rainfall lowers the probability of conflict.[7]

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[4] The standard error is 0.04. The result is based on system-GMM estimation (Blundell and Bond, 1998).

[5] Accounting for the empirical persistence of rainfall does not affect the conclusion but complicates the coefficient formulas in (2).

[6] MSS only report linear probability results for their main (country-fixed-effects) specifications. They show that linear probability results for specifications without fixed effects are almost identical to probit results.

[7] For an insightful theoretical analysis of the link between transitory economic shocks and civil conflict see Chassang and Padró i Miquel (2009).

Now consider explaining the probability of conflict based on current and lagged year-on-year rainfall growth ($RainGrowth_t = \log R_t - \log R_{t-1}$). The least-squares regression yields

(2) $$PPconflict_t = \frac{2\alpha_0 - (\alpha_1 + \alpha_2)}{3} RainGrowth_t + \frac{(\alpha_0 + \alpha_1) - 2\alpha_2}{3} RainGrowth_{t-1}$$

where $PPconflict$ is the predicted probability of conflict.[8] The coefficient on lagged rainfall growth will be negative as long as $2\alpha_2 > \alpha_0 + \alpha_1$. Hence, a negative effect of lagged rainfall growth on conflict, as found by MSS, is consistent with higher rainfall levels increasing the conflict probability at all lags ($\alpha_i > 0$ for $i = 0,1,2$ in (1)) and positive rainfall shocks raising the probability of conflict. Moreover, as long as $\alpha_2 > \alpha_0$, both current and lagged rainfall growth may enter (2) negatively, although higher rainfall levels reduce the probability of conflict at all lags. To see the intuition, suppose that positive rainfall shocks raise the conflict probability with a 2-period lag ($\alpha_2 > 0$). Mean reversion implies that rainfall growth tends to be negative following positive shocks. It is this negative partial correlation between rainfall growth and future conflict that translates into negative effects of rainfall growth in (2).

Linking civil conflict to year-on-year growth of the driving variable would be the appropriate way to estimate the effect of shocks on conflict if shocks to the driving variable were permanent. This is why examining the link between civil conflict and, say, commodity price shocks (which are typically very persistent, see Cashin, Liang, and McDermott, 2000), requires a different approach than examining the link between civil conflict and rainfall shocks.

[8] The least-squares prediction equation is $PPconflict_t = aRainGrowth_t + bRainGrowth_{t-1}$ with a and b implicitly defined by $\text{cov}(\alpha_0 \log R_t + \alpha_1 \log R_{t-1} + \alpha_2 \log R_{t-2}, \log R_t - \log R_{t-1})$ $= a\,\text{var}(\log R_t - \log R_{t-1}) + b\,\text{cov}(\log R_t - \log R_{t-1}, \log R_{t-1} - \log R_{t-2})$ and $\text{cov}(\alpha_0 \log R_t + \alpha_1 \log R_{t-1} + \alpha_2 \log R_{t-2}, \log R_{t-1} - \log R_{t-2})$ $=$ $a\,\text{cov}(\log R_t - \log R_{t-1}, \log R_{t-1} - \log R_{t-2}) + b\,\text{var}(\log R_{t-1} - \log R_{t-2})$. Making use of the assumption that rainfall is i.i.d. yields (2).

I.B. Transitory Economic Shocks and Civil Conflict

While rainfall shocks are transitory, their effect on income need not be. Income dynamics reflect both (stochastic or deterministic) trends π and transitory shocks τ,

(3) $$\ln y_t = \pi_t + \tau_t .$$

Rainfall shocks may affect income through τ or through π and therefore have transitory or permanent income effects.

The effect of rainfall shocks on income is transitory if rainfall shocks affect short-run but not long-run income. Following Dell, Jones, and Olken (2008), the short-run and long-run effect can be estimated by regressing income growth on current and lagged rainfall. Suppose this yields

(4) $$\ln \hat{y}_t - \ln \hat{y}_{t-1} = \hat{\alpha} + \sum_{i=0}^{I} \hat{\beta}_i \log Rain_{t-i} ,$$

where hats denote estimated values. Then a 1-percent year-*t* rainfall shock raises income after *j* periods by $\hat{\beta}_0 + \hat{\beta}_1 + ... + \hat{\beta}_j$ percentage points.

Applying Dell, Jones, and Olken's approach to MSS's data yields that positive rainfall shocks have a highly significant, positive effect on contemporaneous income but that the income effect becomes very small and statistically insignificant after three years.[9] Hence, rainfall shocks cannot serve as an instrument for permanent income shocks. But as rainfall shocks have a significant contemporaneous income effect, they can be used as an instrument for transitory income shocks (assuming that the relevant exclusion restriction can be taken to be satisfied). The practicalities of instrumental-variables estimation of the effect of transitory income shocks on civil conflict are straightforward. First use the standard approaches in macroeconomics (e.g.

[9] Dell, Jones, and Olken (2008) also find that the income effect of rainfall shocks is transitory (for Sub-Saharan African countries as well as a larger sample of countries).

Canova, 2007) to estimate the transitory component τ in (3) country by country. Then run an instrumental-variables regression of civil conflict on the estimated τ instrumented by rainfall. This approach yields consistent point estimates, and standard errors that are valid for testing the null hypothesis of no effect (even though the regressor is generated, see Wooldridge, 2002, Section 6.1.2).

MSS do not take this approach but instead run instrumental-variables regressions of civil conflict on year-on-year income growth instrumented by rainfall growth. If rainfall shocks translate into transitory income shocks, this approach can lead to erroneous conclusions. Intuitively, this is because the transitory nature of rainfall-driven income shocks implies that positive shocks tend to be followed by low income growth. Using income growth as a measure of shocks may therefore lead to the conclusion that conflict is caused by negative economic shocks when conflict is actually caused by positive economic shocks.

II. Empirical Results

Section II.A presents results on the effect of rainfall on conflict in MSS's data. Section II.B turns to the link between rainfall shocks, income shocks, and conflict in the MSS data. Section II.C provides an update using the latest (corrected and extended) data.

II.A. Rainfall Shocks and Civil Conflict in the MSS Data

I examine the effect of rainfall on both conflict onset and conflict incidence. Conflict onset is an indicator variable that is meant to capture conflict outbreak. The year *t* onset indicator is unity if there is a conflict at *t* but there was no conflict at *t*-1; zero if there is no conflict at *t* and there was no conflict at *t*-1; and not defined if there was a conflict at *t*-1. Conflict incidence, on the other hand, is an indicator variable that is unity if there is a conflict at *t* and zero if there is not. Hence, the conflict incidence indicator may be unity because of a new conflict or a continuing conflict. Using conflict incidence as a dependent variable therefore involves an implicit assumption that rainfall affects conflict outbreak and conflict continuation in the same way.

Conflict onset. Table 1, column (1) contains the results of MSS's estimating equation relating conflict onset to rainfall growth, country-specific fixed effects (a_c), and country-specific time trends ($b_c Year_t$),

(5) $$ConflictOnset_{c,t} = a_c + b_c Year_t + \gamma_0 RainGrowth_{c,t} + \gamma_1 RainGrowth_{c,t-1} + \varepsilon_{c,t} .$$

The main result is that *t*-1 rainfall growth has a significantly negative effect on conflict onset at *t*. Following MSS and assuming that rainfall growth is a measure of rainfall shocks, would therefore lead to the conclusion that civil conflict onset is more likely following negative *t*-1 rainfall shocks. Column (2) sheds doubt on this conclusion. The regressors are now rainfall growth at *t*-1 and *t*-2 (rather than *t* and *t*-1). This yields a significantly positive effect of *t*-2 rainfall growth on conflict onset. Hence, MSS's approach is unable to tell whether conflict is caused by negative *t*-1 rainfall "shocks" or positive *t*-2 rainfall "shocks".

The results in column (3) shed light on the link between rainfall shocks and conflict onset in MSS's data and explain the empirical findings in the previous columns. Regressing conflict onset on current and lagged log rainfall levels, yields that conflict onset is more likely following high *t*-2 rainfall. In the specification in column (1), this turns into a negative effect of rainfall growth because this specification captures mean reversion following high rainfall levels. The specification in column (2), on the other hand, captures that high rainfall levels are preceded by high rainfall growth. Column (4) shows that the conclusion of column (3) remains unaffected when I lag rainfall variables by an additional year.

Conflict incidence. Table 2 examines the link between rainfall and civil conflict using conflict incidence as the dependent variable. Column (1) reproduces MSS's result that *t*-1 rainfall growth has a significantly negative effect on conflict incidence. Column (2) adds lagged incidence to MSS's specification, which requires using a system-GMM estimator (Blundell and Bond, 1998). Not surprisingly, there is significant persistence in conflict incidence: civil conflict is 28.4 percentage points more likely when there was a conflict in the previous year (this is more than three times the unconditional probability of conflict outbreak in MSS's sample). The effects of current and lagged rainfall growth are similar to the previous column.

Does the negative effect of lagged rainfall growth on civil conflict incidence in column (2) imply that conflict is associated with low rainfall levels (negative rainfall shocks)? Column (3) sheds some doubt on this conclusion, as the effect of *t*-1 rainfall growth turns insignificant when *t*-2 rainfall growth is included in the regression. Moreover, according to the signs of the point estimates in column (3), MSS's approach yields that civil conflict might be caused by negative *t*-1 rainfall "shocks" or positive *t*-2 rainfall "shocks". The results in column (4) cast light on the link between rainfall shocks and conflict incidence in MSS's data and explain the empirical findings in the previous two columns. Relating conflict incidence to current and lagged log rainfall levels yields that conflict is more likely following high *t*-2 rainfall. This is consistent with the results in the previous two columns because high rainfall levels tend to be followed by low rainfall growth and preceded by high rainfall growth. Column (5) shows that the finding in column (4) is robust to lagging all rainfall variables by one more year.[10]

[10] MSS do not present estimates controlling for lagged conflict incidence. Table 2, column (6) shows how results change when dropping lagged incidence—even though it should be accounted for and turns out to be highly significant statistically—in column (4). In this case, there is no statistically significant effect of rainfall shocks on conflict. Hence, MSS's conclusion that conflict is associated with high rainfall levels continues to be unwarranted. It is interesting to note that the results in column (6) imply a statistically significant increase in the probability of

Summing up, Tables 1 and 2 show that civil conflict is less likely following negative rainfall shocks, which is the opposite of MSS's conclusion using the same data.

II.B. Rainfall, Income, and Civil Conflict in the MSS Data

I first examine whether the effect of rainfall on income is transitory using Dell, Jones, and Olken's approach in (4). Least-squares estimation using MSS's data yields

$$(6) \qquad \ln \hat{y}_{c,t} - \ln \hat{y}_{c,t-1} = \hat{\alpha}_c + \underset{(3.4)}{0.06} \log Rain_{c,t} - \underset{(-1.1)}{0.021} \log Rain_{c,t-1} - \underset{(-2.5)}{0.041} \log Rain_{c,t-2}$$

where $\hat{\alpha}_c$ denotes country c fixed effects, and the numbers in brackets are t-statistics.[11] Hence, a 1-percent rainfall shock at t leads to a statistically significant increase in income at t of 0.06 percentage points. But income at t+1 is predicted to increase by only 0.039 (0.06-0.021) percentage points and income at t+2 by only -0.002 (0.06-0.021-0.041) percentage points. The hypothesis that rainfall shocks do not affect income after two periods cannot be rejected at any conventional confidence level. Hence, the effect of rainfall shocks on income is transitory.

Table 3 examines the link between income and conflict using an instrumental-variables approach. Column (1) reproduces MSS's result that t-1 income growth instrumented by rainfall growth has a significantly negative effect on conflict incidence. This result is the basis of MSS's conclusion that positive economic shocks reduce the probability of civil conflict. Column (2) adds lagged conflict incidence to account for the persistence of civil conflict. The results indicate significant persistence of civil conflict, but the effect of income growth on conflict changes little compared to column (1).

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conflict in year t when a positive t-2 rainfall shock is followed by a negative t-1 rainfall shock. It is this effect of subsequent shocks of alternating sign that is captured by the statistically significant, negative effect of lagged rainfall growth in column (1).

[11] Results are similar when, following MSS, I also control for country-specific linear time trends. In this case the rainfall coefficients (t-statistics) are 0.058 (3.1); -0.019 (-0.9); and -0.035 (-2.1).

Column (3) uses log income levels instrumented by log rainfall levels as an explanatory variable. The implicit assumption is that income dynamics can be described by stationary fluctuations around a country-specific linear time trend, and that fluctuations are partly driven by rainfall shocks. Both of these assumptions can be tested formally. Regarding stationarity around a linear country-specific time trend, I find that the Hadri (2000) panel test against the alternative of non-stationarity for at least one country does not reject at any conventional confidence level. I also find strong effects of rainfall on income fluctuations. Regressing log income on country-specific linear time trends and contemporaneous log rainfall yields a coefficient on rainfall of 0.086 with a t-statistic of 4.48. The results in column (3) indicate a significantly positive effect of *t*-2 income shocks on conflict.[12] To put it differently, negative economic shocks reduce the probability of civil conflict. This is the opposite of MSS's conclusion that negative economic shocks increase the probability of conflict. MSS reach an unwarranted conclusion because they assume that low income growth always reflects negative economic shocks. This assumption is erroneous when income shocks are transitory.

Columns (5) and (6) consider conflict onset as the dependent variable. MSS's approach yields a statistically significant, negative effect of contemporaneous income growth, see column (5). MSS interpret this as evidence that negative economic shocks cause conflict onset. But when I take into account that (rainfall-driven) income shocks are transitory, there is no evidence of a statistically significant link between income shocks and conflict onset, see column (6).

Modern macroeconomic practice uses the Hodrick-Prescott filter to decompose income dynamics into a trend and a cycle (e.g. Canova, 2007). I implement this approach for each Sub-Saharan African country, following Ravn and Uhlig (2002), and then examine whether civil conflict is linked to cyclical income fluctuations. The empirical results are in Table 4. The first

[12] The effect becomes stronger when I drop lagged conflict incidence in column (4).

column shows that the cyclical income component, denoted by GDP HP, is strongly positively related to rainfall. Columns (2)-(4) use rainfall levels as an instrument to estimate the effects of cyclical income fluctuations on civil conflict incidence and onset. The results show that conflict is more likely following positive *t*-2 income shocks.

Summing up, if anything, civil conflict is less likely following negative economic shocks. MSS's approach leads them to unwarranted conclusions because it ignores that rainfall shocks have a transitory effect on income.

II.C. Results Using the Latest Data

MSS's study examines the determinants of civil conflict for the 1981-1999 period. By now, all datasets they use have been extended until 2007.[13] The latest civil conflict data does not always coincide with MSS's data. For example, 14 percent of the conflicts in MSS's data are no longer classified as such. It seems that UCDP/PRIO corrected coding errors.[14] The availability of more, and hopefully improved, data makes it interesting to revisit the link between rainfall shocks and civil conflict.

The results for civil conflict onset are in Table 5, column (1). There is a statistically significant, negative effect of *t*-1 rainfall on civil conflict onset. Hence, civil conflict outbreak is more likely following negative rainfall shocks. This is somewhat surprising as the same specification led to a significantly positive effect of *t*-2 rainfall using MSS's data for the 1981-1999 period, see Table 1, column (3). But this result turns into a significantly negative effect of *t*-1 rainfall once I use the latest (corrected) conflict data for the same period. Moreover, the

[13] For the UCDP/PRIO conflict data see http://www.prio.no/CSCW/Datasets/Armed-Conflict/UCDP-PRIO/. For the GPCP rainfall data see http://precip.gsfc.nasa.gov/. For the PWT income data see http://pwt.econ.upenn.edu/. The conflict data are available for 2008 also, but 2007 is the last year with available rainfall and income data.

[14] The classification criteria do not appear to have changed.

negative effect of *t*-1 rainfall becomes stronger when I extend the sample to 2007. The conflict incidence regression in column (2)—which imposes that rainfall affects new and continuing conflicts in the same way—also yields that conflict is more likely following negative rainfall shocks.[15] But instrumental-variables estimates did not yield a robust link between transitory income shocks and conflict.

III. Conclusion

I show how to estimate the effect of transitory shocks on civil conflict. I also demonstrate that it is critical to tailor the empirical approach to the persistence of shocks, and illustrate this point by revisiting the influential study of Miguel, Satyanath, and Sergenti (2004). They conclude that negative rainfall/economic shocks cause civil conflict. I argue that if anything, the opposite is true in their data. MSS's approach yields unwarranted conclusions because it is inappropriate for transitory shocks. Intuitively, when shocks are transitory, expected year-on-year growth is lowest following positive shocks. MSS's approach assumes that low growth reflects negative shocks and therefore leads to the conclusion that conflict follows negative shocks even when conflict actually follows positive shocks.

I also examine the link between rainfall shocks, income shocks, and civil conflict in the latest data (which corrects and extends MSS's data). These data point towards civil conflict being more likely following negative rainfall shocks. Instrumental-variables estimates do not yield a robust link between transitory income shocks and conflict however.

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[15] To capture shocks to the risk of civil conflict throughout Sub-Saharan Africa, I also controlled for common year effects. These effects turned out to be jointly statistically insignificant for the 1981-2007 period. The effect of *t*-1 rainfall on civil conflict onset and incidence remained negative and statistically significant, but for conflict onset the (positive) effect of *t* rainfall also turned statistically significant.

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Tables

Table 1. Rainfall and Civil Conflict Onset

	(1)	(2)	(3)	(4)
Rainfall Growth, t	-0.062 (-1.44)			
Rainfall Growth, t-1	-0.120* (-1.93)	-0.039 (-0.85)		
Rainfall Growth, t-2		0.087* (1.70)		
Log Rainfall, t			-0.072 (-1.01)	
Log Rainfall, t-1			-0.026 (-0.38)	-0.002 (-0.03)
Log Rainfall, t-2			0.156** (2.31)	0.169** (2.40)
Log Rainfall, t-3				-0.046 (-0.82)
Country FE	Yes	Yes	Yes	Yes
Country Trend	Yes	Yes	Yes	Yes
Observations	555	521	555	521

Note: The left-hand-side variable is civil conflict onset. The method of estimation is least squares. The values in brackets are t-statistics based on Huber robust standard errors clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 2. Rainfall and Civil Conflict Incidence

	(1)	(2)	(3)	(4)	(5)	(6)
Rainfall Growth, t	-0.024 (-0.59)	-0.024 (-0.56)				
Rainfall Growth, t-1	-0.122** (-2.53)	-0.113** (-2.33)	-0.083 (-1.58)			
Rainfall Growth, t-2			0.024 (0.59)			
Log Rainfall, t				-0.026 (-0.36)		-0.076 (-1.18)
Log Rainfall, t-1				-0.069 (-1.00)	-0.038 (-0.51)	-0.115 (-1.61)
Log Rainfall, t-2				0.135** (2.02)	0.152** (2.33)	0.110 (1.49)
Log Rainfall, t-3					0.022 (0.37)	
Lagged Incidence		0.284*** (3.50)	0.286*** (3.49)	0.285*** (3.48)	0.285*** (3.48)	
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Country Trend	Yes	Yes	Yes	Yes	Yes	Yes
Observations	743	702	702	702	702	743

Note: The left-hand-side variable is civil conflict incidence. The method of estimation in columns (1) and (6) is least squares; in columns (2)-(5) system-GMM (Blundell and Bond, 1998). The values in brackets are t-statistics based on Huber robust standard errors clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 3. GDP Growth, GDP, and Civil Conflict

	Civil Conflict Incidence				Civil Conflict Onset	
	(1)	(2)	(3)	(4)	(5)	(6)
GDP Growth, t	-1.132 (-0.87)	-1.223 (-0.97)			-3.154* (-1.85)	
GDP Growth, t-1	-2.546** (-2.48)	-2.328** (-1.96)			-1.840 (-1.36)	
Log GDP, t			-0.678 (-0.56)	-0.846 (-0.92)		-1.278 (-1.01)
Log GDP, t-1			-0.592 (-0.37)	-0.887 (-0.73)		1.590 (1.04)
Log GDP, t-2			2.110* (1.69)	2.310** (2.23)		1.702 (1.37)
Lagged Incidence		0.213** (2.03)	0.284*** (3.44)			
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Country Trend	Yes	Yes	Yes	Yes	Yes	Yes
Observations	743	702	702	743	555	555

Note: The method of estimation is two-stage least squares. The values in brackets are t-statistics based on Huber robust standard errors clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 4. Economic Fluctuations and Civil Conflict

	GDP HP	Civil Conflict Incidence		Civil Conflict Onset
	(1)	(2)	(3)	(4)
Log Rainfall, t	0.033***			
	(2.93)			
Log Rainfall, t-1	0.034**			
	(2.61)			
GDP HP, t		0.352	0.010	0.820
		(0.16)	(0.00)	(0.35)
GDP HP, t-1		-0.190	-0.562	1.928
		(-0.11)	(-0.42)	(1.22)
GDP HP, t-2		3.074*	3.256*	3.124*
		(1.75)	(1.85)	(1.83)
Lagged Incidence		0.218**		
		(2.27)		
Country FE	Yes	Yes	Yes	Yes
Country Trend	Yes	Yes	Yes	Yes
Observations	743	702	743	555

Note: The method of estimation in column (1) is least squares; in columns (2)-(4) two-stage least squares. The values in brackets are t-statistics based on Huber robust standard errors clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 5. Rainfall Shocks and Civil Conflict (1981-2007)

	Conflict Onset	Conflict Incidence
	(1)	(2)
Log Rainfall, t	0.041 (0.91)	0.025 (0.57)
Log Rainfall, t-1	-0.098** (-2.22)	-0.119*** (-2.70)
Log Rainfall, t-2	0.049 (1.38)	0.049 (0.97)
Lagged Incidence		0.399*** (5.87)
Country FE	Yes	Yes
Country Trend	Yes	Yes
Observations	825	1032

Note: The method of estimation in column (1) is least squares; in column (2) system-GMM (Blundell and Bond, 1998). The values in brackets are t-statistics based on Huber robust standard errors clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.