International Commodity Prices, Growth, and the Outbreak of Civil War in Sub-Saharan Africa

by

Markus Brückner and Antonio Ciccone*

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Abstract

To learn more about the effect of economic conditions on civil war, we examine whether Sub-Saharan civil wars are more likely to start following downturns in the international price of countries' main export commodities. The data show a robust effect of commodity price downturns on the outbreak of civil wars. We also find that Sub-Saharan countries are more likely to see civil wars following economic downturns in their main OECD export destinations.

Key words: Commodity prices, civil war, Sub-Saharan Africa
JEL codes: O0, P0, Q0

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* UPF and UPF-ICREA. This is a revision of "*Growth, Democracy, and Civil War*" (CEPR DP 6568, 2007). The main updates are that we extend the empirical analysis to 2006 and that we focus on the average effect of commodity price downturns rather than differences between democracies and non-democracies (these are still in the paper as part of our analysis of cross-country heterogeneity). Contact author antonio.ciccone@upf.edu. Ciccone gratefully acknowledges research support from CREI and CREA. We are grateful to Lars Feld, Marta Reynal-Querol, and Roland Vaubel for useful comments.

1. Introduction

Since 1945, civil wars in Sub-Saharan Africa have led to more than 4 million battle deaths (Sarkees, 2000) and probably many more civilian casualties (Eck and Hultman, 2007). What started these wars? The debate has focused on ethnic divisions, fragile institutions, and economic conditions (World Bank, 2003). But precise answers remain difficult. This is especially evident when it comes to the question whether civil wars are partly caused by economic conditions. For example, it is well known that Sub-Saharan Africa has seen many civil wars and poor economic growth by international comparisons (United Nations Economic Commission for Africa, 1999; World Bank, 2003). Also, countries with an especially bad growth record in the region have had more civil wars. But this does not prove that civil wars are started by worsening economic conditions because civil wars and poor economic growth might be caused by the same factors (Acemoglu, 2005). Moreover, most factors raising the chances of civil war will lower investment and aggregate income, and economic conditions may therefore be the result—rather than cause—of civil war in Sub-Saharan Africa.

To learn more about the effect of economic conditions on Sub-Saharan African civil wars, we examine whether civil wars are more likely to start following downturns in the international price of countries' main exports commodities. That commodity price downturns cause rapidly worsening economic conditions in many Sub-Saharan African economies has been shown by Deaton and Miller (1995) and Deaton (1999). But do commodity price downturns also lead to the outbreak of civil wars? A preliminary piece of evidence comes from Burundi, Rwanda, and Uganda, the three Sub-Saharan African countries most dependent on coffee exports. After the international coffee price dropped by over 50% between 1997 and 2000, civil wars broke out in Burundi in 2000, in Rwanda in 2001, and in Uganda in 2002. This was not the first time that civil wars in these countries were preceded by drops in international coffee prices. The 1991 civil wars in Rwanda and Uganda began after a 40% fall in coffee prices between 1988 and 1991.

The evidence from Burundi, Rwanda, and Uganda alone is not conclusive as politics and geography may have made civil war especially likely (Herbst, 2001; Diamond, 2005;

Kamola, 2007; Robins, 2008). Our analysis therefore includes the international prices of a wide range of Sub-Saharan African commodity exports. We use these international commodity prices to obtain fixed-weight export-price indices for 39 Sub-Saharan countries over the 1980-2006 period. This allows us to ask whether Sub-Saharan African countries experiencing downturns in the international prices of their commodity exports were subsequently more likely to see civil wars. We find that downturns in international commodity prices did make civil war onset more likely. This result is robust to accounting for cross-country differences in the probability of civil war; for country-specific time trends; and for common shocks to the likelihood of civil war across Sub-Saharan Africa. On average, a 20 percent drop in the international export price index raised the probability of a civil war by around 1 percentage point.

Our baseline analysis presumes that international commodity prices do not reflect changes in the probability of future civil wars in Sub-Saharan African exporting countries. This condition would be violated if civil war risk had a significant effect on international commodity prices because of expected civil-war-related supply restrictions. But in this case civil wars in exporting countries should be more likely following rising commodity prices, while we find that civil wars are more likely following falling commodity prices. Also, it is straightforward to restrict the empirical analysis to commodities where Sub-Saharan African countries produce a small share of world supply (less than 3%). We find that our results continue to hold in this case.

Deaton and Miller (1995) and Deaton (1999) have shown that downturns in international commodity prices lead to lower economic growth in Sub-Saharan African exporting countries. This is also the case in our sample, and we can therefore estimate the effect of lower commodity-price-driven growth on the likelihood of civil war onset. The necessary identifying assumption is that international commodity prices affect civil war onset through aggregate income growth only. Our estimates imply that a reduction of income growth by 5 percentage points raises the probability of civil war onset by around 10 percentage points. We test the identifying assumption underlying this estimate by exploiting that growth differences across Sub-Saharan African countries show a strong link to differences in GDP growth across OECD countries they export to (even after accounting for international growth shocks; see Acemoglu et al., 2008, for similar evidence in a wider

sample). This allows us to test for a direct effect of international commodity prices on civil war onset under the assumption that GDP growth differentials across OECD countries affect civil war onset across Sub-Saharan countries only through exports and income growth. We find that the hypothesis that international commodity prices affect the probability of civil war only through aggregate income cannot be rejected.

Our work aims to contribute to the literature on the link between economic conditions and civil war (e.g. Collier and Hoeffler, 1998, 2004; Sambanis, 2002; Fearon and Laitin, 2003; Miguel, Satyanath, and Sergenti, 2004; Hegre and Sambanis, 2006). Within this literature, we are closest to Miguel, Satyanath, and Sergenti (2004). They examine the link between economic growth and civil war in Sub-Saharan Africa exploiting that economic growth in the region depends strongly on rainfall growth. An important difference between their approach and ours is that rainfall shocks are transitory, while international commodity prices revert to their mean only very slowly, if at all (see Cashin, Liang, McDermott, 2000).[1] Hence, economic downturns following falling commodity prices tend to be longer lasting. A difference in the empirical results is that rainfall growth does not predict civil war onset once we account for time-varying factors that affect the probability of civil war throughout Sub-Saharan Africa; the effect of commodity price downturns on civil war onset, on the other hand, is robust.

There is an emerging literature on the link between civil conflict and commodity prices. Angrist and Kugler (2008) and Dube and Vargas (2008) present studies for Columbia. Angrist and Kugler find that Columbian municipalities that saw an increase in coca prices also experienced a surge in violence. Dube and Vargas find the same result for Columbian municipalities with oil, coal, or gold production following a rise in the international prices of these commodities. But when they consider agricultural commodities like coffee, sugar, bananas, and tobacco, they tend to find that higher international prices reduce violence.[2] When we split commodities into natural resources and agricultural

[1] This is also the case for the commodity prices in our sample. Using the augmented Dickey-Fuller test, we cannot reject a unit root for any of the international price series in our sample.

[2] Dube and Vargas argue that the production of agricultural commodities is more labor intensive than the production of oil, coal, or gold. Hence, increases in the price of agricultural commodities tend to have large effects on local wages, which raises the opportunity cost of joining guerilla or paramilitary groups. For a theoretical model about the

products we find that higher international prices reduce the chances of civil war for both groups of commodities, but that the effect is weaker and statistically insignificant for natural resources.[3]

Besley and Persson (2008) examine the effect of commodity export prices on civil war incidence and onset across a wide range of countries. Three main differences with our work are that Besley and Persson are interested in the effect of export prices conditional on income, that they focus on civil war incidence, and that their empirical analysis takes income as exogenous.[4] Assuming such exogeneity is difficult for the Sub-Saharan African countries we focus on as income growth is likely to respond to the risk of civil war. Estimating the effect of international commodity prices conditional on income growth therefore requires an instrument for growth. We take a step in this direction by exploiting that income growth across Sub-Saharan African countries is strongly related to GDP growth across OECD countries they export to. We find that international export prices do not affect civil war onset conditional on income growth, which is consistent with Besley and Persson's result that export prices do not affect civil war onset once income is accounted for.

2. Data and Measurement

Civil conflict. Data on civil conflict is obtained from the UCDP/PRIO Armed Conflicts 2007 Dataset of the International Peace Research Institute's (PRIO) Centre for the Study of Civil War and the Uppsala Conflict Data Program (UCDP).[5] The UCDP/PRIO Armed Conflict Database defines civil conflict as a "contested incompatibility which concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle deaths."[6] The database

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(different) effects of natural resource and agricultural commodity prices on conflict that is tailored to Africa, see Demuynck and Schollaert (2008).

[3] At the same time, we also find that the difference between the effect of agricultural commodities and natural resources is not statistically significant.

[4] See also Frank (2006) who considers the link between commodity prices and civil war in a wide cross-section of countries between 1959 and 1997. He does not control for country fixed effects and common trends in civil war risk however.

[5] The dataset is available at http://new.prio.no/CSCW-Datasets/Data-on-Armed-Conflict.

[6] See www.prio.no/cwp/ArmedConflict or www.pcr.uu.se for more on the definition and coding of civil conflicts.

records both incidence and onset of minor conflicts (25 to 999 battle-related deaths per year) as well as civil wars (at least 1000 battle-related deaths per year). While UCDP/PRIO does not provide information on the exact number of battle deaths, it indicates whether the conflict reached a cumulative death toll of more than 1000 battle deaths. In our sample none of the minor conflicts reached this cumulative death toll, which indicates that these are low-intensity conflicts rather than large-scale intra-state wars. We measure civil war incidence by an indicator variable that takes the value of 1 in a country-year with civil war and 0 otherwise. Civil war onset is an indicator variable that is 1 in a country-year with civil war if there was no war in the previous year; the onset indicator is 0 if there is no civil war in a country-year and there was no war in the previous year.

International commodity price growth. We construct a 1980-2006 international commodity price growth series for each of the 39 Sub-Saharan African countries in our sample following Deaton (1999). The starting point is monthly international commodity price data for 19 commodities for the 1980-2006 period from the International Monetary Fund. Averaging across all observations in a calendar year yields an annual price series for each commodity i, $P_{i,t}$ (the 1990 value is set equal to unity for all commodities).[7] We then obtain each country's export share of these commodities from Deaton for 1990 and, for countries and commodities not covered by Deaton, from the UN Commodity Trade Statistics Database for the year closest to 1990 (commodities and years are listed in the Appendix Table). This allows us to calculate the commodity price index for country c in year t as $ComPrice_{c,t} = \sum_{i=1}^{19} \omega_{c,i} P_{i,t}$, where $\omega_{c,i}$ is the time-invariant export share of commodity i in country c.[8] The annual growth rates of this index are our main explanatory variables.

Export-weighted OECD growth. We also construct an export-weighted GDP growth rate of OECD trading partners for each Sub-Saharan African country in our sample. For Sub-Saharan countries c and year t, the export-weighted GDP growth rate of OECD trading

[7] The commodities are: aluminium, bananas, cocoa, coffee, copper, cotton, fish, gold, groundnuts, iron, livestock, nickel, oil, phosphates, sugar, tea, tobacco, wood, uranium. The data comes from http://www.imf.org/external/np/res/commod/externaldata.csv.

[8] The commodities and weights used for each country are listed in the Appendix Table.

partners j is $ExportsOECD_{c,t} = \sum_{j=1}^{30} \theta_{c,j} GDPGrowth_{j,t}$ **,** where $\theta_{c,j}$ is the (time-invariant) exports of country c to country j as a share of country c's GDP in 1990 and $GDPGrowth_{j,t}$ the real GDP growth rate of OECD countries j. The GDP data is from the WDI (2008) and export data from OECD Statistics (2008).[9] This variable is closely related to Acemoglu et al.'s (2008) trade-weighted world income instrument.

Rainfall growth. Our data on rainfall growth covers the 1979-2006 period and comes from the NASA Global Precipitation Climatology Project (GPCP), Version 2 (Adler et. al, 2003).[10] The rainfall data is that of Miguel, Satyanath, and Sergenti (2004) but covers a longer time period. The GPCP rainfall data are based on data from satellites and rain gauges. Alternative rainfall data sets are based on rain gauges only, which has the disadvantage that gauge coverage in many Sub-Saharan African countries is very sparse and that the number of reporting stations may be affected by socio-economic conditions.

Income growth. Data for real income per capita growth are taken from the Penn World Tables 6.2 for the 1981-2004 period (the data stops in 2004) and from the World Development Indicators (2008) for the 2004-2006 period.

Democracy. We employ two different measures of democracy. Our first measure is based on the combined polity score of the Polity IV database (Marshall and Jaggers, 2002), which ranges from +10 (full democracy) to -10 (full autocracy). Following Marshall and Jaggers (2002) and Persson and Tabellini (2003, 2006), we generate a democracy indicator that takes the value of 1 if the polity score is strictly positive and the value 0 otherwise. Our second main measure of democracy is based on the Freedom House ranking (Freedom House, 2007) that classifies countries as free, partly free, or not free. We construct an indicator variable that is 1 if Freedom House classifies the country as free or partly free and 0 for countries that are classified as not free.

Other Variables. We also use data on the share of government expenditure in GDP from the PWT 6.2; data on the share of military expenditure in GDP, data on annual exports

[9] Available at http://stats.oecd.org/WBOS/index.aspx.
[10] The data comes from http://precip.gsfc.nasa.gov.

growth, and data on annual terms of trade growth from the WDI (2008); and data on net official development aid from the OECD Statistics (2008).

Table 1 provides some descriptive statistics of our data.

3. Estimation Framework

Our main estimating equation links the indicator for civil war onset to commodity price growth and other controls,

$$(1) \qquad ConflictOnset_{ct} = \alpha_c + \beta_c t + \delta_t + \gamma ComPriceGrowth_{ct} + \varepsilon_{ct},$$

where $ComPriceGrowth_{ct}$ is the growth rate of international commodity prices over the three years leading up to t (we also estimate separate effects for annual growth rates). Our estimates account for country fixed effects (α_c), country-specific trends ($\beta_c t$), and shocks that are common to Sub-Saharan African countries (δ_t). ε_{ct} is a disturbance term that can be serially correlated.

In addition to (1), we also estimate an equation with GDP growth instead of commodity price growth on the right-hand-side. Our main method of estimation is two-stage least squares with commodity price growth as an instrument for GDP growth. Notice that linear two-stage least squares is the preferred method of estimation despite the dichotomous explanatory variable, as alternative approaches require strong specification assumptions (Angrist and Krueger, 2001; Wooldridge, 2002).

4. Empirical Results

International commodity prices and civil war onset. Table 2 contains our results on the effect of international commodity prices on civil war onset. In column (1) we link civil war onset in year t to the growth of international commodity prices in the 3 previous years, without any additional controls (we stop at 3 lags as additional lags are never significant). The estimates show that the risk of civil war outbreak is significantly higher when the price of export commodities drops. A 50 percent drop in the international export price between t

and *t*-1 increases the probability of civil war onset by around 3 percentage points (more than 100% of the average probability of civil war onset in Sub-Saharan Africa, see Table 1). Column (2) shows that this result becomes somewhat stronger when we account for cross-country differences in the probability of civil war by including country fixed effects in the empirical analysis. The result strengthens further when we control for country-specific trends in column (3). Now we also obtain a significant effect of lagged commodity price growth. Column (4) finds that our results are robust to common year effects (due, for example, to a world business cycle or socio-political trends that affect all Sub-Saharan African countries). Column (5) estimates the effect of the 3-year growth rate of international commodity prices on civil war onset (we will focus on this 3-year growth rate from now on). This specification yields that a 50 percent drop in the international export price over three years raises the probability of civil war onset by around 3 percentage points.[11]

In column (6), we look at the link between rainfall growth and civil war. We do not find any significant effects, which contrasts with Miguel, Satyanath, and Sergenti (2004). The difference arises because Miguel, Satyanath, and Sergenti do not control for common Sub-Saharan African risk factors.[12]

In Table 3 we repeat the analysis for the onset of civil conflict, which includes both civil wars and conflicts that UCDP/PRIO classifies as minor. In this case there is no significant link between conflict onset and commodity price or rainfall growth once year effects are accounted for (columns (4)-(6)).[13]

Economic growth and civil war onset. Table 4 examines the link between Sub-Saharan economic growth and the outbreak of civil war. The strategy is to use commodity price growth as an instrument for economic growth. Column (1) estimates the first-stage relation

[11] Using a logit fixed effects model also yields a negative coefficient on the international commodity price index that is significant at the 5% level.

[12] We find that year effects are always jointly significant at the 1% level at least.

[13] Ciccone (2008) argues that rainfall growth is not the right variable to examine whether negative rainfall shocks make civil conflict more likely. This is because rainfall shocks are transitory, which implies that rainfall growth may be low either because of a negative rainfall shock or because of mean reversion following a positive shock. He finds that negative rainfall shocks do make civil conflict onset more likely in the appropriate empirical specifications, but that there is no link between rainfall shocks and civil war onset.

between Sub-Saharan countries' growth of GDP per capita and commodity price growth, controlling for country fixed effects (which capture country-specific differences in steady state growth rates), country specific time trends (capturing convergence effects), and year fixed effects (which capture world business cycle and other shocks that are Africa wide). The main finding is that falling international commodity prices reduce the economic growth rates of Sub-Saharan economies, which is in line with Deaton and Miller (1995) and Deaton (1999). The point estimate implies that a 50 percent drop in international commodity prices reduces real per capita GDP growth by over 1.2 percentage points. This effect is highly statistically significant (the t-statistic is 3.42).

Column (2) contains the least-squares effect of GDP per capita growth on civil war onset. The point estimate is negative, and significant at the 5% level. This cannot be taken as evidence of a causal effect of per capita GDP growth on civil war risk however. The estimate may overstate the causal effect because a greater likelihood of civil war is likely to be associated with a substantial decline in per capita GDP due to flight of domestic and foreign capital. It is also possible that the causal effect is understated because of omitted variables bias and classical measurement error bias (measurement error is known to be particularly severe in Sub-Saharan African national account statistics, see Heston, 1994, and Deaton, 2005).

Columns (3)-(6) present two-stage least-squares estimates of the effect of GDP per capita growth on civil war risk. The instrumental variable estimates are larger than the least squares estimates. For example, in column (6) we find that a one-percentage point drop in per capita GDP increases the risk of civil war onset by nearly 2 percentage points (controlling for country fixed effects, country specific time trends, and year fixed effects). This estimate is more than 5 times larger than the corresponding least-squares estimate in column (2) and statistically significant at the 5 percent level (a formal Hausman test rejects equivalence of the least squares and IV estimate at the 10% level).

For the two-stage least squares estimates in Table 4 to be valid, international commodity prices should affect civil war onset through its effects on average income. This would be the case, for example, if governments' ability to suppress rebellion or buy peace depended on taxes, and tax revenues depended on average incomes only; or if the

opportunity cost of potential rebels depended on average incomes only in the economy.[14] But it is also possible that commodity prices affect civil war onset through channels other than average income. Tables 5 and 6 examine this possibility.

In Table 5 we exploit that per capita income growth of Sub-Saharan African countries is strongly affected by GDP growth of their main OECD export destinations. This can be seen in column (1), where higher OECD growth has a positive and highly significant effect on Sub-Saharan per capita income growth, even after controlling for country fixed effects, country time trends, and year effects (OECD growth is the GDP growth rate of OECD countries weighted by export shares of Sub-Saharan African countries in 1990, see Section 2 for details). Moreover, as shown in column (2), higher OECD growth also lowers the likelihood of civil war onset. This motivates our two-stage least squares analysis in column (3), which uses both commodity price growth and OECD growth as an instrument for Sub-Saharan African income per capita growth. We find that lower income growth raises the risk of civil war (compared to column (6) of Table 3, this yields a statistically stronger but quantitatively smaller effect). As we have two instruments for income per capita growth, we can test the overidentifying restrictions. According to the Hansen J, p-value reported in the table, these restrictions cannot be rejected at standard confidence levels. Column (5) adds commodity price growth and column (6) OECD growth as a separate regressor to test for direct effects conditional on income per capita growth. Both regressions yield statistically insignificant direct effects.

Table 6 takes a different perspective on whether commodity price growth affects civil war onset through channels other than average income. In columns (1) and (2), we examine whether commodity price growth affects government and military expenditures of Sub-Saharan African countries as a share of GDP. If this were the case, our commodity-price-growth effects on civil war onset might not arise through average income. But columns (1) and (2) do not yield evidence of significant effects of commodity price growth on the government or military expenditure share. Columns (3) and (4) check on the evidence that commodity price growth and OECD growth affect Sub-Saharan African countries'

[14] Note however that the opportunity-cost theory of civil conflicts is based on transitory shocks, see Chassang and Padró i Miquel (2006, 2007), while commodity price shocks are very persistent.

income through their effects on exports and terms of trade. As can be seen from the significantly positive point estimates this seems to be the case. Column (5) examines whether OECD growth affects Sub-Saharan African countries by increasing foreign aid flows but finds no evidence for this hypothesis.

Further results. Table 7, column (1) looks at the link between civil war onset and international commodity prices after dropping commodities where Sub-Saharan African countries are large suppliers from the price index. Specifically we drop all commodities where Sub-Saharan African countries produce more than 3% of world supply (see the Appendix Table for details). This changes the estimate very little, as can be seen by comparing the result in column (1) with Table 2, column (5).[15]

Another interesting issue is whether prices of agricultural goods and of natural resources have different effects on civil conflict (e.g. Dube and Vargas, 2008; Demuynck and Schollaert, 2008). We look at this issue by running separate regressions for agricultural commodity prices (in column (2)) and natural resource commodity prices (in column (3)). Column (2) shows that international commodity price shocks to the agricultural sector have quantitatively large and statistically significant effects on the probability of civil war outbreak in Sub-Saharan Africa. Repeating the analysis for commodities produced in the mining and oil sector in column (3), yields insignificant effects. It is important to note however that the number of observations decreases substantially; in fact, the estimate in column (3) is very imprecise and we therefore cannot reject the hypothesis that the effects of agricultural and natural resource commodities are identical.

Table 8, columns (1) and (2) explore whether democratic institutions reduce the impact of commodity–price fluctuations on the risk of civil war onset.[16] Columns (1) and (2) look at this question by interacting the growth rate of the international commodity price

[15] Estimates are actually stronger in Table 7 than Table 2, which is consistent with the idea that estimates in Table 2 are biased upwards if there is an effect of civil war risk on commodity prices.

[16] See also Besley and Burgess (2002), who examine the link between political competition and disaster relief in India. Easterly, Gatti, and Kurlat (2006) show that discrete improvements in democracy in the 20th century were also associated with fewer mass killings of unarmed civilians.

index with two indicators of institutional democracy. The democracy indicator in column (1) follows Persson and Tabellini (2003, 2006) and takes the value of 1 if the revised combined Polity IV measure of democracy is strictly positive and zero else. The democracy indicator in column (2) is from Freedom House (2006) and takes on the value of 1 if Freedom House classifies countries as "Free" or "Partially Free". We focus on country-year observations where the country was an autocracy or a democracy for the past three years (to make sure that we are not capturing effects of commodity price shocks on political institutions).[17] The results in columns (1) and (2) show that the effect of international commodity price shocks on civil war risk is significantly smaller in democracies. The estimates also imply that commodity-price drops raised civil war risk significantly in dictatorships but not in democracies.

Table 8, column (3) explores whether civil war risk following commodity price drops is smaller in richer countries. To do so we interact commodity price growth with countries' log income per capita in the beginning of our sample (1979; the variable is measured as deviation from average income in the sample in 1979). We find a significantly positive interaction, which implies that commodity price shocks did have smaller effects in richer countries. Our estimates imply that the impact of international commodity price shocks on civil war onset risk was particularly pronounced in the countries that were poorest in 1979, but absent in the richest countries.[18] Columns (4) and (5) combine the democracy and initial income interactions. This changes results very little in the case of the Persson and Tabellini democracy indicator in column (4), but leads to insignificant interaction in the case of the Freedom House indicator in column (5).

Table 9 examines whether commodity price growth, OECD growth, or rainfall growth affect when civil wars end. The only statistically significant estimates in the table refer to OECD growth. They show that civil wars are more likely to stop following upswings in OECD demand for Sub-Saharan exports.

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[17] We code periods where the country switches from autocracy to democracy as missing values. It is worthwhile noting that we obtain similar results when the interaction is with autocracy/democracy in *t*-1.

[18] In a world of volatile commodity prices, this implies that there could be countries that get trapped into a vicious circle of poverty and civil war, see also Easterly and Levin (1997).

4. Summary

Our goal has been to learn more about the effect of economic conditions on Sub-Saharan African civil wars. To do so, we examine whether civil wars were more likely to start following downturns in the international price of countries' main export commodities. Our empirical results show a robust effect of commodity price downturns on the outbreak of civil wars. We also find that Sub-Saharan countries are more likely to see civil wars following lower growth in OECD countries that buy their goods; moreover, civil wars are more likely to end following higher growth in these OECD countries.

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TABLE 1. Descriptive Statistics

	Mean	Std. Dev.	No. Obs.
Civil Conflict Incidence (PRIO/UPSALLA 2007)	0.247	0.431	916
Civil Conflict Onset (PRIO/UPSALLA 2007)	0.055	0.228	690
Civil Conflict Offset (PRIO/UPSALLA 2007)	0.168	0.375	226
Civil War Incidence (PRIO/UPSALLA 2007)	0.109	0.312	916
Civil War Onset (PRIO/UPSALLA 2007)	0.028	0.166	814
Civil War Offset (PRIO/UPSALLA 2007)	0.245	0.432	102
International Commodity Price Growth, Index (IMF)	0.059	0.356	916
GPCP Rainfall Growth, Adler et al. (2006)	0.022	0.218	916
OECD GDP Growth, WDI (2007) and OECD (2007)	2.335	6.608	916
Real Per Capita GDP Growth (PWT 6.2 and WDI (2008))	0.028	0.089	916
Government Expenditure in GDP Growth (PWT 6.2)	0.013	0.177	777
Military Expenditure in GDP Growth (WDI (2008))	0.034	0.625	532
Net Official Development Aid Growth (OECD, 2008)	0.135	1.208	898
Terms of Trade Growth (WDI 2008)	0.004	0.148	773
Export Growth (WDI 2008)	0.095	0.261	873
Democracy (Polity IV)	0.308	0.462	916
Democracy (Freedom House)	0.461	0.499	916

TABLE 2. Commodity Price Shocks and Civil War Onset

	Civil War Onset					
	(1)	(2)	(3)	(4)	(5)	(6)
	LS	LS	LS	LS	LS	LS
Commodity Price Growth, t	-0.060*	-0.074**	-0.084**	-0.065**		
	(-1.77)	(-2.19)	(-1.98)	(-2.15)		
Commodity Price Growth, t-1	0.003	-0.007	-0.021	-0.048		
	(0.13)	(-0.28)	(-0.86)	(-1.25)		
Commodity Price Growth, t-2	-0.056	-0.052	-0.072*	-0.105**		
	(-1.57)	(-1.39)	(-1.75)	(-2.29)		
3-Year Commodity Price Growth					-0.060**	
					(-2.15)	
Rainfall Growth, t						-0.006
						(-0.29)
Rainfall Growth, t-1						-0.005
						(-0.22)
Rainfall Growth, t-2						-0.017
						(-0.56)
Country FE	No	Yes	Yes	Yes	Yes	Yes
Time Trends	No	No	Yes	Yes	Yes	Yes
Year FE	No	No	No	Yes	Yes	Yes
No. Observations	814	814	814	814	814	814

Note: Method of estimation is least squares; t-values reported in parentheses are based on Huber robust standard errors that are clustered at the country level. The dependent variable is civil war onset. *3 Year Commodity Price Growth* is the commodity price growth rate between *t* and *t*-3. * Significantly different from zero at the 90 percent confidence level, ** 95 percent confidence level, *** 99 percent confidence level.

TABLE 3. Commodity Price Shocks and Civil Conflict Onset

	Civil Conflict Onset					
	(1)	(2)	(3)	(4)	(5)	(6)
	LS	LS	LS	LS	LS	LS
Commodity Price Growth, t	0.119*	0.102*	0.045	0.084		
	(1.87)	(1.78)	(0.87)	(1.55)		
Commodity Price Growth, t-1	-0.074**	-0.065	-0.104*	-0.086		
	(-1.98)	(-1.55)	(-1.89)	(-1.22)		
Commodity Price Growth, t-2	0.035	0.021	-0.030	-0.038		
	(0.51)	(0.36)	(-0.80)	(-0.83)		
3-Year Commodity Price Growth					-0.024	
					(-0.66)	
Rainfall Growth, t						0.053
						(1.15)
Rainfall Growth, t-1						-0.035
						(-0.77)
Rainfall Growth, t-2						0.023
						(0.41)
Country FE	No	Yes	Yes	Yes	Yes	Yes
Time Trends	No	No	Yes	Yes	Yes	Yes
Year FE	No	No	No	Yes	Yes	Yes
No. Observations	690	690	690	690	690	690

Note: Method of estimation is least squares; t-values reported in parentheses are based on Huber robust standard errors that are clustered at the country level. The dependent variable is civil conflict onset. *3 Year Commodity Price Growth* is the commodity price growth rate between *t* and *t*-3. * Significantly different from zero at the 90 percent confidence level, ** 95 percent confidence level, *** 99 percent confidence level.

Table 4. Economic Growth and Civil War Onset

	GDP Growth	Civil War Onset				
	(1)	(2)	(3)	(4)	(5)	(6)
	LS	LS	2SLS	2SLS	2SLS	2SLS
3-Year Commodity Price Growth	0.025*** (3.42)					
Per Capita GDP Growth		-0.325** (-2.39)	-1.354* (-1.72)	-1.643* (-1.74)	-1.755* (-1.83)	-1.953** (-1.96)
Country FE	Yes	No	No	Yes	Yes	Yes
Time Trends	Yes	No	No	No	Yes	Yes
Year FE	Yes	No	No	No	No	Yes
No. Observations	916	814	814	814	814	814

Note: The method of estimation in columns (1) and (2) is least squares, columns (3)-(6) two-stage least squares; t-values reported in parentheses are based on Huber robust standard errors that are clustered at the country level. The dependent variable in column (1) is per capita GDP growth, columns (2)-(6) civil war onset. *3 Year Commodity Price Growth* is the commodity price growth rate between *t* and *t*-3. The instrumental variable in columns (3)-(6) is the commodity price growth rate between *t* and *t*-3. * Significantly different from zero at the 90 percent confidence level, ** 95 percent confidence level, *** 99 percent confidence level.

Table 5. Export Demand, Economic Growth, and Civil War Onset

	GDP Growth	Civil War Onset				
	(1)	(2)	(3)	(4)	(5)	(6)
	LS	LS	LS	2SLS	2SLS	2SLS
3-Year Commodity Price Growth	0.028*** (3.53)	-0.062** (-2.19)	-0.050* (-1.70)		-0.041 (-1.36)	
OECD Growth	0.010*** (10.53)	-0.006*** (-4.16)				0.011 (1.27)
Per Capita GDP Growth			-0.351** (-2.37)	-0.803*** (-5.45)	-0.639*** (-5.68)	-1.867** (-2.02)
Hansen J, p-value				0.1642		
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time Trends	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
No. Observations	916	814	814	814	814	814

Note: The method of estimation in columns (1)-(3) is least squares, columns (4)-(6) two-stage least squares; t-values reported in parentheses are based on Huber robust standard errors that are clustered at the country level. The dependent variable in column (1) is per capita GDP growth, columns (2)-(6) civil war onset. *3 Year Commodity Price Growth* is the commodity price growth rate between *t* and *t*-3. The instrumental variables in columns (4)-(6) is the commodity price growth rate between *t* and *t*-3 and OECD growth. * Significantly different from zero at the 90 percent confidence level, ** 95 percent confidence level, *** 99 percent confidence level.

Table 6. Another Look at Channels

	Government Expenditure Share	Military Expenditure Share	Growth of Terms of Trade	Growth of Exports	Growth of Development Aid
	(1)	(2)	(3)	(4)	(5)
	LS	LS	LS	LS	LS
3-Year Commodity Price Growth	0.011 (0.59)	-0.054 (-0.79)	0.115*** (5.09)	0.131*** (4.03)	0.096 (0.71)
OECD Growth	-0.001 (-0.49)	0.018 (0.50)	0.009** (2.49)	0.013** (2.13)	-0.001 (-0.26)
Country FE	Yes	Yes	Yes	Yes	Yes
Time Trends	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
No Observations	777	532	773	873	898

Note: Method of estimation is least squares; t-values reported in parentheses are based on Huber robust standard errors that are clustered at the country level. The dependent variable in column (1) is the growth rate of the share of government expenditure in GDP; the dependent variable in column (2) is the growth rate of the share of military expenditure in GDP; in column (3) the dependent variable is terms of trade growth; in column (4) the dependent variable is export growth; and in column (5) the dependent variable is the growth rate of (net) official development aid (ODA). *3 Year Commodity Price Growth* is the commodity price growth rate between *t* and *t*-3. * Significantly different from zero at the 90 percent confidence level, ** 95 percent confidence level, *** 99 percent confidence level.

TABLE 7. Commodity Price Shocks and Civil War Onset

	Civil War Onset		
	(1)	(2)	(3)
	LS	LS	LS
	Excluding > 3% World Supply	Agriculture Only	Mining and Oil Only
3-Year Commodity Price Growth	-0.073** (-2.27)	-0.089** (-2.21)	-0.001 (-0.04)
Country FE	Yes	Yes	Yes
Time Trends	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
No. Observations	764	652	588

Note: Method of estimation is least squares; t-values reported in parentheses are based on Huber robust standard errors that are clustered at the country level. The dependent variable is civil war onset. *3 Year Commodity Price Growth* is the commodity price growth rate between *t* and *t*-3. Column (1) drops commodities from a country's (time-invariant) commodity basket if the country produces more than 3% of world supply of the commodity (see Appendix Table 1). Column (2) drops commodities from a country's commodity basket that are produced in the mining and oil sector, column (3) drops those commodities that are produced in the agricultural sector. * Significantly different from zero at the 90 percent confidence level, ** 95 percent confidence level, *** 99 percent confidence level.

Table 8. Heterogeneity in the Effect of Commodity Prices On Civil War Onset

	Civil War Onset				
	(1)	(2)	(3)	(4)	(5)
	LS	LS	LS	LS	LS
3-Year Commodity Price Growth	-0.101**	-0.099**	-0.047*	-0.875**	-0.088**
	(-2.49)	(-2.25)	(-1.90)	(-2.40)	(-2.04)
3-Year Commodity Price Growth* Democracy [Polity IV]	0.074*			0.067*	
	(1.76)			(1.67)	
3-Year Commodity Price Growth* Democracy [FH]		0.088*			0.080
		(1.72)			(1.59)
3-Year Commodity Price Growth* GDP79			0.053*	0.045**	0.026
			(1.84)	(2.22)	(1.14)
Democracy	0.050	0.002		0.052*	0.002
	(1.56)	(0.08)		(1.64)	(0.09)
Country FE	Yes	Yes	Yes	Yes	Yes
Time Trends	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
No. Observations	749	689	814	749	689

Note: Method of estimation is least squares; t-values reported in parentheses are based on Huber robust standard errors that are clustered at the country level. The dependent variable is civil war onset. *3 Year Commodity Price Growth* is the commodity price growth rate between *t* and *t*-3. *Democracy [Polity IV]* is an indicator variable that is 1 if between *t*-1 and *t*-3 the country has a strictly positive Polity2 score, 0 if between *t*-1 and *t*-3 the country's Polity2 score was smaller or equal to 0, and missing if between *t*-1 and *t*-3 the country switched between positive to negative Polity2 scores. *Democracy [FH]* is an indicator variable that is 1 if between *t*-1 and *t*-3 Freedom House classifies a country as free or partially free, 0 if between *t*-1 and *t*-3 the country is not free, and missing if between *t*-1 and *t*-3 the country switched from free or partially free to not free. *GDP79* is the difference between a country's log real per capita GDP in 1979 and the log of the 1979 sample average real per capita GDP. * Significantly different from zero at the 90 percent confidence level, ** 95 percent confidence level, *** 99 percent confidence level.

TABLE 9: Commodity Price Shocks and Civil War Offset

	Civil War Offset					
	(1)	(2)	(3)	(4)	(5)	(6)
	LS	LS	LS	LS	LS	LS
Commodity Price Growth, t	-0.060 (-0.45)	0.033 (0.20)	-0.275 (-1.63)	-0.243 (-1.48)		
Commodity Price Growth, t-1	-0.170 (-0.82)	-0.003 (-0.02)	-0.158 (-1.14)	-0.110 (-0.56)		
Commodity Price Growth, t-2	0.212 (0.96)	0.207 (0.85)	0.162 (0.97)	0.168 (1.14)		
3-Year Commodity Price Growth					-0.089 (-0.61)	-0.079 (-0.49)
OECD Growth						0.036** (2.13)
Rainfall Growth, t						-0.095 (-0.47)
Rainfall Growth, t-1						0.205 (0.73)
Rainfall Growth, t-2						0.036 (0.73)
Country FE	No	Yes	Yes	Yes	Yes	Yes
Time Trends	No	No	Yes	Yes	Yes	Yes
Year FE	No	No	No	Yes	Yes	Yes
No. Observations	102	102	102	102	102	102

Note: Method of estimation is least squares; t-values reported in parentheses are based on Huber robust standard errors that are clustered at the country level. The dependent variable is civil war offset. *3 Year Commodity Price Growth* is the commodity price growth rate between *t* and *t*-3. * Significantly different from zero at the 90 percent confidence level, ** 95 percent confidence level, *** 99 percent confidence level.

APPENDIX TABLE 1. Commodity Exports of Sub-Saharan Countries

Country	**Commodities**
Angola	Oil (93)
Benin	Cotton (42), Oil (22)
Botswana	Nickel (10), Copper (6)* [2000]
Burkina Faso	Cotton (57), Gold (20)
Burundi	Coffee (75), Tea (10)
Cameroon	Oil (50), Wood (9)*, Cocoa (8)*+, Aluminium (7)*, Coffee (8)*, Cotton (3)* [1990]
Central African Republic	Coffee (11), Wood (19)*, Cotton (11)*, Tobacco (1)* [1993]
Chad	Cotton (85)
Congo	Oil (85)
Ethiopia	Coffee (45), Sugar (2)* [1993]
Gabon	Oil (75), Wood (11)
Gambia	Groundnuts (20), Fish (32), Cotton (3)
Ghana	Cocoa (29)+, Aluminium (18), Gold (13), Wood (11),
Guinea	Aluminium (64)*, Coffee (6)*, Gold (2)*, Cotton (1)* [1995]
Guinea-Bissau	Oil (14), Fish (28), Banana (50)*, Wood (4)*, Cotton (2)* [1995]
Ivory-Coast	Cocoa (33)+ , Wood (16), Coffee (9)*, Oil (9)* [1995]
Kenya	Tea (19)+, Oil (13), Coffee (14), Fish(2)* [1990]
Liberia	Iron (62)*, Coffee (6)*, Cocoa (3)* [1984]
Madagascar	Coffee (13), Fish (14), Sugar (7)*, Cotton (4)*, Oil* (1) [1990]
Malawi	Tobacco (68), Tea (11)
Mali	Cotton (62)
Mauritania	Iron (55), Fish (35)
Mozambique	Fish (36), Cotton (8)*, Sugar (7)* [1994]
Namibia	Fish (18)*, Uranium (2)*+, Gold (2) *, Copper (1)* [2000]
Niger	Uranium (83)+
Nigeria	Oil (93)+
Rwanda	Coffee (61), Gold (20)
Senegal	Oil (12), Groundnuts (17), Fish (28), Phosphates (6)*, Cotton (1)* [1990]
Sierra Leone	Aluminium (19), Cocoa (15)*, Coffee (4)*, Fish (1)* [1984]
Somalia	Livestock (90)* [1982]
South Africa	Gold (50)*+, Iron (36)*, Aluminium (15)* [2000]
Sudan	Cotton (42), Sugar (6)* [1990]
Swaziland	Sugar (22), Cotton (2)* [1990]
Tanzania	Cotton (18), Coffee (19), Sugar (13), Gold (5)
Togo	Cotton (21), Phosphates (44)
Uganda	Coffee (74)
Zaire	Copper (46), Oil (10)
Zambia	Copper (88)
Zimbabwe	Tobacco (24)+, Iron (10)*, Cotton (6)*, Copper (2)* [1990]

Note: The data comes predominantly from Deaton (1999) and refers to 1990. When listed commodities comprised less than two thirds of total exports according to the United Nations Commodity Trade Statistics Database, we added commodities using data for the year (indicated in brackets) closest to 1990. Commodity data added to Deaton is marked by an *. Commodities produced in a country that constitute more than 3% of the world commodity supply are marked by a + (based on the information provided by the US Government International Energy Statistics (oil), International Cocoa Association (cocoa), International Coffee Association (coffee), FAO (tea), WHO (tobacco), World Gold Council (gold), and World Nuclear Association (uranium)).