Agricultural Prices and the Onset of Civil War

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Abstract

Overall, causal studies indicate that increases in agricultural prices reduce armed civil conflict in producing regions, consistent with an opportunity-cost channel. However, the onset of civil wars—the most lethal conflicts—appears to be an exception. I show that divergent findings stem from differences in how commodity price indices are constructed. Using a global panel of 118 low- and middle-income countries from 1957 to 2007, I compare three approaches in the literature: (1) a basket index with country-specific export weights held constant over time; (2) a principal-export index based on each country's main agricultural export, held constant over time; and (3) a basket index with time-varying export weights. Indices (1) and (2), which isolate price changes by holding export composition constant, indicate that increases in international agricultural prices substantially reduce the onset of civil wars. Effects are stronger for the fixed-weight basket index, which captures price changes across a broader set of each country's agricultural exports than does the principal-export index. In contrast, the basket index with time-varying export weights in (3) yields estimates that are not statistically significant. Taken together, my results extend the emerging consensus on the causal effect of agricultural prices to the most lethal civil conflicts.

*University of Mannheim and CEPR; antonio.ciccone@uni-mannheim.de. The data and a `Stata` program to replicate all results and analyze variations of all specifications are available at https://www.vwl.uni-mannheim.de/en/ciccone/. I thank Alexander Göppert, Moritz Drechsel-Grau, and Hassieb Pakzad for excellent research assistance, and Halvard Buhaug, Francesco Caselli, Matthieu Couttenier, Ruben Durante, Libertad Gonzalez, Ruixue Jia, Marta Reynal-Querol, Dominic Rohner, Pooja Singh, Alessandro Tarozzi, Mathias Thoenig, and Ayman Tibi for helpful comments. This paper supersedes the 2019 mimeo "International Commodity Prices and Civil War Onset: New Evidence for Sub-Saharan Africa and Beyond."

1 Introduction

A large body of research has examined the effect of commodity prices on armed civil conflict. In a meta-analysis of natural experiments, Blair et al. (2021) conclude that increases in agricultural prices reduce armed civil conflict in producing regions and that this is consistent with an opportunity-cost channel: increases in agricultural prices raise the opportunity cost of fighting by generating employment opportunities for potential combatants (Dal Bó and Dal Bó, 2011).[1]

An important exception in Blair et al.'s meta-analysis of agricultural price effects concerns the onset of the most lethal type of civil conflict—civil war. Since 1945, civil wars have caused tens of millions of deaths through combat, famine, and disease (e.g., Fearon and Laitin, 2003; Ghobarah et al., 2003; Eck and Hultman, 2007). The study in Blair et al. that examines the opportunity-cost channel for civil war onset finds little evidence of an inverse relationship between changes in agricultural commodity prices and the likelihood of war onset.

There could be several explanations for this exception, including that the opportunity-cost channel matters for the onset of lower-intensity civil conflicts but not civil wars.[2] I examine a basic issue concerning the construction of commodity price indices (e.g., Deaton and Miller, 1995; Bazzi and Blattman, 2014; Caselli and Tesei, 2016). The literature constructs these indices using three methods—each represented in Blair et al.'s meta-analysis. I show that conclusions about the effect of agricultural prices on civil war onset depend on the method used.

The first method for constructing commodity price indices originates with Deaton and Miller (1995). Their goal is to examine the effect of changes in international commodity prices over time on economic growth and political leadership in Sub-Saharan Africa. They construct a commodity price index for each country as a weighted average of international commodity prices, with commodity weights equal to the share of each commodity in the value of the country's total commodity exports. Export shares used as weights are fixed in a base year. Because export weights are fixed over time, changes in the price index over time—*price-index shocks*—only reflect changes in international commodity prices, not changes in export quantities

[1] They distinguish four types of commodities–agricultural commodities, commercial minerals, artisanal minerals, and oil and gas–and find support for the opportunity-cost channel only for agricultural commodity prices.

[2] Following seminal work on civil war by Collier and Hoeffler (1998, 2004) and Fearon and Laitin (2003), the literature has explored a range of economic, political, and institutional causes; see Burke et al. (2009), Buhaug (2010), and Djankov and Reynal-Querol (2010) for example and the reviews by Blattman and Miguel (2010), Couttenier and Soubeyran (2015), and Hegre (2018).

(Deaton and Miller, p. 40). Using time-varying export shares instead would imply that changes over time in the price index also reflect (potentially endogenous) changes in export quantities.[3] In that case, estimated effects of price-index changes on outcomes would not identify the effect of international price shocks. Instead, they would conflate the effect of price shocks with the effect of (potentially endogenous) changes in export quantities (Deaton and Miller, p. 40).

Deaton and Miller's fixed-weight basket index has become standard in country-level studies of the effects of price shocks (e.g., Collier and Dehn, 2001; Raddatz, 2007; Collier and Goderis, 2012; Benguria et al., 2024; Romero, 2025) and has been adapted to subnational settings (e.g., Fjelde, 2015; McGuirk and Burke, 2020, both included in Blair et al.'s meta-analysis).[4]

The second method can be seen as the simplest possible fixed-weight price index. Rather than constructing the commodity price index based on a commodity basket, a single commodity is selected for each country or region and assigned a (fixed) weight of one over the study period. The price index is therefore simply the price of the selected commodity. Selection is based on export or production values, or on the research focus (e.g., Dube and Vargas, 2013; Jablonski and Oliver, 2013; Knorr, 2015; Caselli and Tesei, 2016; Berman et al., 2017; Gong and Sullivan, 2017; Guardado, 2018; Andersen et al., 2022). This method is the most common among the 19 studies of agricultural price effects in Blair et al. (2021). Following Caselli and Tesei (2016), I focus on the price of each country's principal (agricultural) commodity export.

Like Deaton and Miller's (1995) approach, the second method uses fixed commodity weights over time to ensure that price-index shocks reflect changes in prices rather than (endogenous) changes in quantities (Caselli and Tesei, 2016). Because it focuses on a single commodity, the method is simpler than Deaton and Miller's. A potential drawback is that it yields a less precise measure of aggregate price shocks when multiple commodities are produced in a country or region—which may increase attenuation bias and the risk of failing to detect a true effect.

[3]When discussing the determinants of political leadership changes, Deaton and Miller clarify that endogeneity cannot be resolved by constructing the price index using lagged export shares because "political events often cause economic changes that occur *before* the political events themselves" (p. 70, emphasis in original). The same logic extends to civil wars: political instability may precede them and trigger economic crises and shifts in commodity production or exports. If the goal is not the identification of commodity price effects but of commodity export-income effects, time-varying export shares would be preferable to fixed export shares provided changes in export quantities are exogenous.

[4]While I focus on commodity price shocks, the fixed-weight approach has also been employed to examine the effects of agricultural demand shocks and of commodity terms-of-trade shocks on civil conflict (e.g., Berman and Couttenier, 2015; Janus and Riera-Crichton, 2015).

The third method constructs the commodity price index by weighting commodity prices with time-varying export shares. This method is used by two studies of agricultural price effects in Blair et al.'s meta-analysis, including the study examining civil war onset (Bazzi and Blattman, 2014). If export quantities are constant over time, time-varying export shares yield a more accurate measure of aggregate commodity price shocks at different points in time—which would reduce attenuation bias and the risk of missing true effects. However, if export quantities change over time, the measure of aggregate commodity price shocks may actually become less precise and potentially endogenous, since changes over time in the price index will also reflect changes over time in export quantities (Deaton and Miller, 1995).

I examine how the three methods for constructing price indices in the literature influence conclusions about the effect of agricultural prices on civil war onset. The analysis draws on data for 118 low- and middle-income countries from 1957 to 2007 and yields three main findings.

First, when the price index is constructed based on a basket of agricultural commodities using fixed export weights, agricultural price shocks have a negative and significant effect on civil war onset in the global sample over 1957–2007 at conventional levels ($p \leq 0.034$). The estimates imply that a one-standard-deviation increase in the agricultural price shock reduces the likelihood of civil war onset by approximately 30 percent relative to the baseline risk. Following Miguel et al. (2004), several recent studies have focused on civil war in Sub-Saharan Africa after 1980. I therefore also examine Sub-Saharan Africa over 1980–2007. This yields stronger negative effects of agricultural price shocks on civil war onset.

Second, when the price index is based solely on each country's principal agricultural export, the effect of price shocks on civil war onset is weaker than when using the price index based on a basket of commodities with fixed export weights. Nevertheless, year-on-year price shocks continue to have a negative and statistically significant effect on civil war onset at conventional levels in the global sample over 1980–2007. Again, effects are stronger in Sub-Saharan Africa.

Third, the price index based on a basket of agricultural commodities with time-varying export weights yields effects of agricultural price shocks on civil war onset that are not statistically significant at conventional levels. Relative to the time-varying index, effect sizes with the fixed-weight price index are generally more than twice as large.

These findings show that the method used to construct agricultural commodity price indices

shapes conclusions about the effect of agricultural prices on civil war onset. Evidence from the fixed-weight basket index—designed to ensure that changes in the price index over time reflect price changes rather than quantity changes—indicates that increases in agricultural prices reduced the risk of civil war onset globally between 1957 and 2007.

The remainder of the paper is organized as follows. Section 2 describes the data, Section 3 outlines the empirical framework, and Section 4 presents the results. Section 5 concludes.

2 Data

The dataset comes from Bazzi and Blattman (2014) and covers civil wars in 118 low- and middle-income countries in Africa, the Middle East, Latin America, and Asia from 1957 to 2007. It includes data on the exports of 65 globally traded commodities over the same period and annual international prices for each commodity. These commodities span agriculture, forestry, fishing, mining, and quarrying, including oil and natural gas. I use the Uppsala Conflict Data Program/Peace Research Institute Oslo (UCDP/PRIO) Armed Conflict Dataset definition of civil war included in the dataset. This is the standard definition in the literature on exogenous economic shocks and civil war (e.g., Miguel et al., 2004; Sandholt Jensen and Skrede Gleditsch, 2009). UCDP/PRIO defines a civil war as a *contested incompatibility* over government or territory in which armed conflict between two parties, at least one of which is the state's government, results in at least 1,000 battle-related deaths within a calendar year. The calendar-year coding of civil war employed by UCDP/PRIO is important because it aligns with the calendar-year coding of commodity price shocks in the dataset. The coding of UCDP/PRIO civil war onset in the dataset follows Miguel et al. (2004) but incorporates Sandholt Jensen and Skrede Gleditsch's (2009) focus on domestic civil wars. That is, a country-year is coded as experiencing a civil war only when the country's government is involved in an armed conflict over its own government or territory. This excludes cases where the country's government is involved in civil wars abroad, such as Nigeria's participation as part of a multinational peacekeeping force in the Liberian and Sierra Leonean civil wars in the 1990s. Sandholt Jensen and Skrede Gleditsch argue that the opportunity-cost theory connects economic shocks in a country to conflict within its own territory, not to its government's involvement in foreign civil wars, and therefore recommend focusing on domestic civil wars.

3 Country-Specific Commodity Price Shocks

The empirical analysis of the effect of international commodity price shocks on the likelihood of civil war onset employs three alternative methods of constructing country-specific price indices.

The first method is that of Deaton and Miller(1995). The (log) price index for country c in year t is

$$\log P_{c,t}^{FW} = \sum_{i=1}^{N} e_{i,c} \log p_{i,t} \tag{1}$$

where $p_{i,t}$ denotes the international price of commodity i in year t, and $e_{i,c}$ denotes commodity export shares of country c—the value of the exports of commodity i as a share of the value of the country's total commodity exports—fixed in a base year. N is the number of commodities in the commodity basket. I will refer to this price index as the fixed-weight (FW) price index.

Following Deaton and Miller, I construct the price index in equation (1) using commodity export shares $e_{i,c}$ in a base year. Alternatively, I set each country's (fixed) export shares in (1) equal to the average export shares of commodities i over the study period.

The commodity price shocks in country c in year t using the Deaton and Miller price index are obtained as the change in the (log) price index in (1) between year t and year $t-1$

$$Pshock_{c,t}^{FW} = \log P_{c,t}^{FW} - \log P_{c,t-1}^{FW}. \tag{2}$$

The second method is a simplified version of the fixed-weight price index in equation (1). Each country's commodity basket includes only its principal export commodity, and the weight of that commodity is set equal to one. As a result, the fixed-weight price shock in (2) using this price index is simply the change in the price of the country's principal export commodity. Following Caselli and Tesei (2016), I identify each country's principal export commodity as the one with the highest export share in the largest number of years over the study period.

The third method is based on a commodity basket, as in Deaton and Miller's (1995) approach in equation (1), but uses time-varying (TV) commodity weights $\omega_{i,c,t}^{TV}$ for each country

$$\log P_{c,t}^{TV} = \sum_{i=1}^{N} \omega_{i,c,t}^{TV} \log p_{i,t}. \tag{3}$$

I use the time-varying commodity weights of Bazzi and Blattman (2014),[5] which are based on lagged moving averages of commodity export shares. Specifically

$$\omega_{i,c,t}^{TV} = \frac{(e_{i,c,t-2}^{tot} + e_{i,c,t-3}^{tot} + e_{i,c,t-4}^{tot})/3}{\sum_{i=1}^{N}(e_{i,c,t-2}^{tot} + e_{i,c,t-3}^{tot} + e_{i,c,t-4}^{tot})/3} \tag{4}$$

where $e_{i,c,t}^{tot}$ denotes the value of country c's exports of commodity i in year t as a share of the value of *total* exports, including *non*-commodity exports,

$$e_{i,c,t}^{tot} = \frac{\textit{exports of commodity } i \textit{ by country } c \textit{ in year } t}{\textit{total exports by country } c \textit{ in year } t}. \tag{5}$$

While the shares in (5) do not sum to one across commodities, the denominator of the right-hand side of (4) ensures that the commodity weights used in the construction of the price index in (3) do sum to one.[6] Hence, the commodity weights used to construct the price index with fixed weights in (1) and time-varying weights in (3) both sum to one across commodities.

The time-varying-weight price shocks in country c in year t are obtained analogously to equation (2), as the change in the (log) price index in (3) between year t and year $t-1$

$$Pshock_{c,t}^{TV} = \log P_{c,t}^{TV} - \log P_{c,t-1}^{TV}. \tag{6}$$

When the export shares of commodity i and country c in equation (4) are all set equal to the values in a base year, the price index in (3) collapses to the fixed-weight index in (1).

Following Deaton and Miller (1995), Deaton (1999), and Caselli and Tesei (2016), I also consider the effect of price shocks over three-year periods. These shocks are defined analogously to the price shocks in (2) and (6), except that the difference is between the price index in years t and $t-3$. To address Deaton and Miller's concern that exogeneity may be compromised by commodity supply shocks in countries that are large exporters, I assess the robustness of the results by calculating price shocks that exclude commodities in years where the country's exports exceed a certain percentage of global exports.

[5]Their commodity price index (Online Appendix, p. 3) differs slightly from P^{TV} in (3), but in an aspect that is empirically inconsequential. Their index is P^{TV} in (3) divided by the US consumer price index (US CPI), which is equivalent to subtracting the log of the US CPI from (3). As the US CPI term is the same for each country, it is absorbed by year fixed effects and therefore does not affect price-shock estimates.

[6]The normalization is implicit and can be readily verified from Bazzi and Blattman's dataset by summing the commodity weights of their price index (Online Appendix, p. 3) across commodities.

4 Agricultural Price Shocks and Civil War Onset

I begin by examining how agricultural price shocks affect civil war onset in Sub-Saharan Africa and then extend the analysis to the global sample of 118 low- and middle-income countries. Agricultural commodities are defined as products from agriculture, forestry, and fisheries.[7]

The data span the 1957–2007 period. Because several recent studies of the effect of economic shocks on civil war focus on Sub-Saharan Africa since 1980 (e.g., Miguel et al., 2004; Sandholt Jensen and Skrede Gleditsch, 2009; Brückner and Ciccone, 2010), I first report empirical results for the 1980–2007 period and then extend the analysis to 1957–2007.

All empirical specifications are linear probability models with country and year fixed effects as well as country-specific linear trends. I also control for price shocks to minerals, metals, oil, and gas.[8] These shocks mostly do not have a statistically significant effect on civil war onset.[9]

4.1 Agricultural Prices and Civil War Onset in Sub-Saharan Africa

Table 1, Panel A reports the effects of contemporaneous and lagged year-on-year agricultural price shocks on civil war onset in Sub-Saharan Africa over 1980–2007. The results in column (1) are based on the price index constructed using a basket of commodities with time-varying weights, as defined in equation (3). The agricultural price index is obtained by summing over agricultural commodities, while the price index for minerals, metals, oil, and gas (used to obtain the controls) is obtained by summing over all commodities in those categories.[10]

The main finding in column (1) is that contemporaneous and lagged year-on-year agricultural price shocks do not have a statistically significant effect on civil war onset. This holds for

[7]Agricultural, forestry, and fisheries commodities correspond to SITC product groups *Food and live animals* and *Beverages and tobacco*, plus relevant subcategories of *Crude materials, inedible, except fuels* (e.g., forestry and fisheries products). See Bazzi and Blattman (2014, Online Appendix) for details.

[8]Minerals, metals, oil, and gas correspond to SITC product groups *mineral fuels, lubricants, and related materials*, relevant subcategories of *crude materials, inedible, except fuels*, and processed metals.

[9]Blair et al.'s (2021) meta-analysis of the effect of commodity price shocks on armed civil conflict distinguishes between three types of non-agricultural commodities—commercial minerals, artisanal minerals, and oil and gas. It finds that while prices of commercial minerals have no effect on conflict, higher prices of artisanal minerals and of oil and gas increase conflict risk. I construct price shocks based on a single, aggregate price index for minerals, metals, oil, and gas, which may help explain why the estimated effects are mostly not statistically significant. The dataset employed here does not distinguish between commercial and artisanal minerals. See Andersen et al. (2022) for evidence on oil price shocks and civil conflict using the same UCDP/PRIO Armed Conflict Dataset employed here. Using data for 132 countries over the 1962–2009 period, they find that positive oil price shocks escalate conflict in onshore-rich countries but de-escalate it in offshore-rich ones.

[10]Results using a single, combined price index for all commodities are reported in Appendix Tables 1 and 2.

each of the three year-on-year shocks individually as well as for their cumulative effect.

The results in column (2) use the Caselli and Tesei (2016) price index for principal export commodities. Hence, year-on-year price shocks capture changes in the price of each country's main commodity export. The effect of price shocks on civil war onset is allowed to vary depending on whether this commodity is agricultural or instead a mineral, metal, oil, or gas.

Using the Caselli and Tesei principal-export price index yields three key findings. First, lagged $(t-2)$ agricultural price shocks now have a negative and statistically significant effect on civil war onset at conventional levels ($p = 0.071$). Second, the cumulative effect of contemporaneous and lagged agricultural price shocks is also negative and statistically significant ($p = 0.051$). Third, the magnitude of the cumulative effect of agricultural price shocks on the likelihood of civil war onset is approximately 50 percent larger when using the Caselli and Tesei price index than when using the price index with time-varying export weights in column (1).

The results in columns (3) and (4) employ the Deaton and Miller (1995) price index based on a commodity basket with fixed export weights, as defined in equation (1). In column (3), the weights are each country's commodity export shares in 1990, following Deaton (1999). In column (4), the weights are each country's average export shares over the period (1980–2007).[11]

The three key results using the Deaton and Miller fixed-weight basket index reinforce those using the Caselli and Tesei principal-export price index. First, lagged $(t-2)$ agricultural price shocks again have a negative and statistically significant effect on civil war onset at conventional levels ($p = 0.071$ in column (3); $p = 0.062$ in column (4)). Second, the cumulative effect of agricultural price shocks is also negative and statistically significant ($p = 0.049$ and $p = 0.051$, respectively). Third, the magnitude of the cumulative effect of agricultural price shocks on civil war onset is larger with the Deaton and Miller price index than with the price index with time-varying export weights in column (1)—about twice as large.

Summing up, the findings in Table 1, Panel A show that using the Caselli and Tesei principal-export price index and the Deaton and Miller fixed-weight basket index results in negative and statistically significant effects of lagged $(t-2)$ year-on-year agricultural price shocks on civil war onset in Sub-Saharan Africa over 1980–2007. The cumulative effect of the three year-on-

[11] Deaton (1999) only reports data on 1990 export shares. The dataset used here includes export shares for 1957–2007. Hence, fixing export shares at their 1990 values, or any other single year, is less clearly justified, which is why I also use averages over the study period.

year agricultural price shocks is also negative and significant. In contrast, price shocks based on the price index using time-varying export shares produce statistically insignificant effects. Cumulative effect sizes using the fixed-weight price index based on a basket of commodities are about twice as large as those obtained using time-varying weights.

The estimates in Panel A imply a substantial impact of agricultural price shocks on the risk of civil war onset. The standard deviation of the year-on-year agricultural price shocks is around 0.19 for the Caselli and Tesei shocks and around 0.12 for the Deaton and Miller shocks. Hence, a one-standard-deviation increase in the agricultural price shock at $t-2$ lowers the risk of civil war onset by about 1.3–1.5 percentage points. This is approximately half the baseline risk of civil war onset of 2.6 percent in Sub-Saharan Africa over the period.

Table 1, Panel B examines the effects of agricultural price shocks over three-year periods, following Deaton and Miller (1995), Deaton (1999), and Caselli and Tesei (2016). These three-year shocks are defined analogously to the year-on-year agricultural price shocks in Panel A, except that the difference is between the log price index in years t and $t-3$.

The three main findings for the three-year agricultural price shocks in Panel B mirror those in Panel A. First, estimates based on the agricultural price index using time-varying export weights produce a statistically insignificant effect of agricultural price shocks on civil war onset. Second, both the Caselli and Tesei principal-export price index and the Deaton and Miller fixed-weight basket index result in negative effects of agricultural price shocks on civil war onset and these effects are statistically significant at conventional levels ($p \leq 0.055$ in columns (2)–(4)). Third, relative to the effect when using the price index with time-varying weights, effect sizes are approximately 50 percent larger using the Caselli and Tesei price index and more than twice as large using the Deaton and Miller price index.

The standard deviation of the three-year agricultural price shocks in Panel B is around 0.27 for the Caselli and Tesei shocks and around 0.18 for the Deaton and Miller shocks. Hence, the three fixed-weight estimates in columns (2)–(4) imply that a one-standard-deviation increase in the three-year price shock lowers the risk of civil war onset by around 1.6 percentage points. This is around 60 percent of the baseline risk of civil war onset of 2.6 percent.

Finally, Table 1, Panel C shows the results for the (longest available) 1957–2007 period.

The specifications are analogous to those for 1980–2007 in Panel B.[12] There are three main findings. First, agricultural price shocks based on the price index with time-varying weights still result in a statistically insignificant effect on civil war onset. Second, using the Caselli and Tesei principal-export price index continues to yield an effect that is about 50 percent larger than using the price index with time-varying weights. However, the effect is now statistically insignificant at conventional levels. Third, using the Deaton and Miller fixed-export basket price index, the effect of agricultural price shocks on civil war onset is more than twice as large as when using the price index with time-varying weights and the estimates are statistically significant at conventional levels ($p = 0.055$ in column (3); $p = 0.05$ in column (4)).[13]

The standard deviation of the Deaton and Miller agricultural price shocks in Panel C is around 0.22. Hence, the estimates in columns (3) and (4) imply that a one-standard-deviation increase in the agricultural price shock lowers the risk of civil war onset by around 1 percentage point. This is about half of the 1957–2007 baseline risk of civil war onset of 2.1 percent.

Summing up, the results in Table 1 show that both the Caselli and Tesei principal-export price index and the Deaton and Miller fixed-weight basket index yield negative and statistically significant effects of lagged year-on-year agricultural price shocks on civil war onset in Sub-Saharan Africa over the 1980–2007 period. The cumulative effects of year-on-year price shocks on civil war onset are also negative and statistically significant, as are the effects of three-year agricultural price shocks. The fixed-weight basket index also results in negative and significant effects of three-year agricultural price shocks on civil war onset over the 1957–2007 period. The agricultural price index using time-varying export weights produces statistically insignificant effects on civil war onset. Relative to the effect when using the price index with time-varying weights, effect sizes are approximately 50 percent larger using the Caselli and Tesei price index and more than twice as large using the Deaton and Miller price index.

[12] I use 1980 export weights in column (3) to account for the study period extending further into the past.

[13] While the estimates of agricultural price shocks on civil war onset remain negative and significant over the 1957–2007 period when using the Deaton and Miller fixed-export basket index, they are less than half of those over the more recent 1980–2007 period. This could reflect weaker effects of agricultural price shocks on civil war onset prior to 1980. Alternatively, it could be the result of stronger attenuation bias due to lower quality and coverage of the commodity export data in earlier years.

4.2 Global Evidence on Agricultural Prices and Civil War Onset

Table 2 examines the effect of international agricultural prices on civil war onset in the global sample of 118 low- and middle-income countries in Africa, the Middle East, Latin America, and Asia. I again begin with the 1980–2007 period and then extend the analysis to 1957–2007.

Table 2, Panel A reports the effects of contemporaneous and lagged year-on-year agricultural price shocks on civil war onset. Column (1) shows the results based on the price index with time-varying weights in equation (3). The effects are statistically insignificant. This holds for each of the three year-on-year shocks individually as well as for their cumulative effect.

The results in column (2) use the Caselli and Tesei (2016) price index for principal export commodities. This yields three main findings. First, contemporaneous agricultural price shocks now have a negative and statistically significant effect on civil war onset at conventional levels ($p = 0.089$). Second, the cumulative effect of contemporaneous and lagged agricultural price shocks is also negative and statistically significant ($p = 0.064$). Third, the size of the cumulative effect of agricultural price shocks on civil war onset is twice as large using the Caselli and Tesei price index as when using the price index with time-varying export weights in column (1).

The results in columns (3) and (4) employ the Deaton and Miller (1995) price index based on a commodity basket with fixed export weights, as defined in equation (1). There are three key results. First, contemporaneous as well as lagged $(t-2)$ agricultural price shocks have a negative and statistically significant effect on civil war onset at conventional levels ($p = 0.077$ and $p = 0.085$, respectively, in column (3); $p = 0.091$ and $p = 0.096$, respectively, in column (4)). Second, the cumulative effect of agricultural price shocks is negative and statistically significant ($p = 0.064$ in column (3); $p = 0.053$ in column (4)). Third, cumulative effect sizes are substantially larger when using the price index with fixed export weights than when using the price index with time-varying export weights in column (1)—more than three times as large.

Summing up, the findings in Table 2, Panel A show that both the Caselli and Tesei principal-export price index and the Deaton and Miller fixed-weight index result in negative and statistically significant effects of year-on-year agricultural price shocks on civil war onset in the global sample over 1980–2007. The cumulative effect of the year-on-year price shocks is also negative and significant using both price indices. On the other hand, price shocks based on the index with time-varying export weights produce statistically insignificant effects. Relative to

the effect when using the price index with time-varying weights, cumulative effect sizes are more than two times as large using the Caselli and Tesei and the Deaton and Miller price indices.

The estimates in Panel A imply a substantial impact of agricultural price shocks on the global risk of civil war onset. The standard deviation of the year-on-year agricultural price shocks is about 0.16 for the Caselli and Tesei shocks and 0.11 for the Deaton and Miller shocks. The estimates of the contemporaneous effect of agricultural price shocks in columns (2)–(4) therefore imply that a one-standard-deviation increase in the price shock lowers the risk of civil war onset by around 0.9 percentage points. This is approximately 40 percent of the global baseline risk of civil war onset of 2.1 percent over the 1980–2007 period.

Table 2, Panel B examines the effects of three-year agricultural price shocks. The findings using the price index based on a basket of agricultural commodities mirror those in Panel A. First, using the price index with time-varying export weights produces a statistically insignificant effect of agricultural price shocks on the likelihood of civil war onset at conventional levels. Second, the fixed-weight basket price index yields negative effects of agricultural price shocks on civil war onset that are statistically significant at conventional levels ($p = 0.055$ in column (3); $p = 0.050$ in column (4)). Third, the fixed-weight basket index yields a substantially larger effect of agricultural price shocks on civil war onset than the price index with time-varying weights—around three times as large. While using the Caselli and Tesei principal-export price index yields an effect of three-year agricultural price shocks that is about twice as large as when using the price index with time-varying weights, the estimate is (just) statistically insignificant at conventional levels ($p = 0.101$).

The standard deviation of the three-year agricultural price shocks in Panel B is about 0.27 for the Caselli and Tesei shocks and 0.18 for the Deaton and Miller shocks. Hence, the three fixed-weight estimates in columns (2)–(4) imply that a one-standard-deviation increase in the three-year agricultural price shock lowers the risk of civil war onset by about 0.8 to 1 percentage point, around 40 percent of the baseline risk of civil war onset of 2.1 percent.

Finally, Table 2, Panel C reports estimates of the effect of three-year agricultural price shocks on global civil war onset over the (longest available) 1957–2007 period. There are three key findings. First, the specification using the price index with time-varying export weights continues to produce a statistically insignificant effect of agricultural price shocks on civil war

onset. Second, the specifications in columns (3) and (4) using the price index based on a commodity basket with fixed export weights again yield statistically significant negative effects of agricultural price shocks on civil war onset at conventional levels ($p = 0.030$ in column (3); $p = 0.034$ in column (4)). Third, the fixed-weight basket index yields much larger effects of agricultural price shocks on civil war onset than the price index with time-varying weights. On the other hand, using the price index based solely on each country's principal agricultural export yields a statistically insignificant effect in the global sample over the 1957–2007 period.

The standard deviation of the three-year Deaton and Miller agricultural price shocks in Panel C is about 0.19. The estimates in columns (3) and (4) therefore imply that a one-standard-deviation increase in the price shock lowers the risk of civil war onset by roughly 0.5–0.6 percentage points. This corresponds to about 30 percent of the global baseline risk of civil war onset over the 1957–2007 period.

Summing up, the results in Table 2 show that the Deaton and Miller fixed-weight basket index yields negative and statistically significant effects of contemporaneous and lagged year-on-year agricultural price shocks on civil war onset globally over the 1980–2007 period. The cumulative effect of year-on-year agricultural price shocks on civil war onset is also negative and statistically significant, as is the effect of three-year agricultural price shocks. The fixed-weight price index based on a basket of agricultural commodities continues to result in a negative and statistically significant effect of three-year agricultural price shocks on civil war onset over the 1957–2007 period. In contrast, agricultural price shocks based on the price index using time-varying export weights yield statistically insignificant effects on civil war onset. Relative to the effect when using the price index with time-varying weights, effect sizes in the global sample are more than three times as large using the price index with fixed weights.

5 Conclusion

This study examined whether shocks to international agricultural prices had an effect on the onset of civil wars in a global sample of 118 low- and middle-income countries and in Sub-Saharan Africa between 1957 and 2007. The empirical analysis considered all three methods of constructing price indices—and thus price shocks—used in the literature.

When the price index is constructed based on a basket of agricultural commodities using

fixed export weights for each country, increases in agricultural prices have reduced civil war onset in the global sample over 1957–2007. The effects are statistically significant at conventional levels and stronger after 1980 and in Sub-Saharan Africa. When the price index is constructed based solely on each country's principal agricultural export over the study period, year-on-year increases in agricultural prices are found to have reduced civil war onset in the global sample over 1980–2007, again with stronger effects in Sub-Saharan Africa. On the other hand, the price index constructed using time-varying export weights yields statistically insignificant effects at conventional levels. Relative to the effect when using the price index with time-varying weights, effect sizes are generally more than two times as large using the price index with fixed weights.

These findings have two main implications. First, the method used to construct commodity price indices affects conclusions about the impact of agricultural price shocks on the risk of civil war onset. Second, evidence from the fixed-weight basket index—designed to ensure that changes in the price index over time reflect price changes rather than quantity changes—shows that increases in agricultural prices reduced civil war onset globally between 1957 and 2007.

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TABLE 1: Agricultural Price Shocks and Civil War in Sub-Saharan Africa

Panel A: Year-on-Year Agricultural Commodity Price Shocks 1980–2007

	Time-Varying Export Weights	Fixed Export Weights		
		Principal Export Commodity Weight=1	Year 1990	Period Average 1980–2007
	(1)	(2)	(3)	(4)
Year-on-Year Agricultural Price Shock t	-0.058	-0.072	-0.110	-0.117
	(0.045)	(0.05)	(0.076)	(0.084)
Year-on-Year Agricultural Price Shock $t-1$	-0.015	-0.045	-0.032	-0.052
	(0.038)	(0.036)	(0.053)	(0.060)
Year-on-Year Agricultural Price Shock $t-2$	-0.054	-0.079*	-0.111*	-0.123*
	(0.05)	(0.042)	(0.060)	(0.064)
Sum of the Three Agricultural Price Effects	-0.127	-0.195*	-0.253**	-0.292*
	(0.092)	(0.097)	(0.125)	(0.146)
Minerals etc. Price Shock Controls	Three Lags	Three Lags	Three Lags	Three Lags
Observations	1,007	1,007	1,007	1,007
Countries	45	45	45	45
R^2	0.246	0.250	0.251	0.249

Panel B: Three-Year Agricultural Commodity Price Shocks 1980–2007

	Time-Varying Export Weights	Fixed Export Weights		
		Principal Export Commodity Weight=1	Year 1990	Period Average 1980–2007
	(1)	(2)	(3)	(4)
Three-Year Agricultural Price Shock t	-0.042	-0.065*	-0.085*	-0.098**
	(0.03)	(0.033)	(0.043)	(0.050)
Three-Year Minerals etc. Price Shock t	-0.055*	-0.026	-0.057	-0.042
	(0.03)	(0.029)	(0.039)	(0.034)
Observations	1,007	1,007	1,007	1,007
Countries	45	45	45	45
R^2	0.244	0.247	0.248	0.248

Panel C: Three-Year Agricultural Commodity Price Shocks 1957–2007

	Time-Varying Export Weights	Fixed Export Weights		
		Principal Export Commodity Weight=1	Year 1980	Period Average 1957–2007
	(1)	(2)	(3)	(4)
Three-Year Agricultural Price Shock t	-0.015	-0.023	-0.041*	-0.047**
	(0.014)	(0.015)	(0.021)	(0.023)
Three-Year Minerals etc. Price Shock t	-0.019	-0.005	-0.011	-0.019
	(0.013)	(0.008)	(0.013)	(0.015)
Observations	1,805	1,805	1,805	1,805
Countries	45	45	45	45
R^2	0.176	0.177	0.178	0.178

Notes: * $p < 0.10$, ** $p < 0.05$. Standard errors in parentheses are clustered at the country level. The left-hand-side variable in all regressions is an indicator variable for civil war onset. All regressions control for country fixed effects, year fixed effects, and country-specific linear time trends. Year-on-year commodity price shocks in t refer to the change in the log of the commodity price index of country c between years t and $t-1$, $\log P_{c,t} - \log P_{c,t-1}$. Three-year price shocks refer to the change in the log price index between years t and $t-3$. "Agricultural" refers to commodities in agriculture, forestry, and fisheries. "Minerals etc." refers to minerals, metals, oil, and gas. The principal agricultural export commodity of country c employed to construct the price index used in column (2) is identified following Caselli and Tesei (2016). The fixed-weight approach in columns (3) and (4) follows Deaton and Miller (1995). See the main text for details.

TABLE 2: Global Evidence on Agricultural Price Shocks and Civil War

Panel A: Year-on-Year Agricultural Commodity Price Shocks 1980–2007

Commodity Export Weights	Time-Varying Export Weights	Fixed Export Weights		
		Principal Export Commodity Weight=1	Year 1990	Period Average 1980–2007
	(1)	(2)	(3)	(4)
Year-on-Year Agricultural Price Shock t	-0.021	-0.058*	-0.080*	-0.085*
	(0.022)	(0.034)	(0.045)	(0.050)
Year-on-Year Agricultural Price Shock $t-1$	-0.004	-0.011	-0.003	-0.025
	(0.020)	(0.023)	(0.034)	(0.039)
Year-on-Year Agricultural Price Shock $t-2$	-0.027	-0.040	-0.071*	-0.077*
	(0.025)	(0.026)	(0.041)	(0.046)
Sum of the Three Agricultural Price Effects	-0.052	-0.109*	-0.154*	-0.186*
	(0.045)	(0.064)	(0.082)	(0.095)
Minerals etc. Price Shock Controls	Three Lags	Three Lags	Three Lags	Three Lags
Observations	2,662	2,662	2,662	2,662
Countries	118	118	118	118
R^2	0.250	0.252	0.252	0.251

Panel B: Three-Year Agricultural Commodity Price Shocks 1980–2007

	Time-Varying Export Weights	Fixed Export Weights		
		Principal Export Commodity Weight=1	Year 1990	Period Average 1980–2007
	(1)	(2)	(3)	(4)
Three-Year Agricultural Price Shock t	-0.017	-0.036	-0.052*	-0.061*
	(0.015)	(0.022)	(0.028)	(0.032)
Three-Year Minerals etc. Price Shock t	-0.026*	-0.001	-0.016	-0.016
	(0.015)	(0.015)	(0.017)	(0.017)
Observations	2,662	2,662	2,662	2,662
Countries	118	118	118	118
R^2	0.249	0.250	0.250	0.250

Panel C: Three-Year Agricultural Commodity Price Shocks 1957–2007

	Time-Varying Export Weights	Fixed Export Weights		
		Principal Export Commodity Weight=1	Year 1980	Period Average 1957–2007
	(1)	(2)	(3)	(4)
Three-Year Agricultural Price Shock t	-0.001	-0.010	-0.027**	-0.031**
	(0.008)	(0.009)	(0.012)	(0.015)
Three-Year Minerals etc. Price Shock t	-0.005	0.006	-0.007	-0.004
	(0.008)	(0.007)	(0.008)	(0.009)
Observations	4,781	4,781	4,781	4,781
Countries	118	118	118	118
R^2	0.168	0.168	0.169	0.169

Notes: * $p < 0.10$, ** $p < 0.05$. Standard errors in parentheses are clustered at the country level. The left-hand-side variable in all regressions is an indicator variable for civil war onset. All regressions control for country fixed effects, year fixed effects, and country-specific linear time trends. Year-on-year commodity price shocks in t refer to the change in the log of the commodity price index of country c between years t and $t-1$, $\log P_{c,t} - \log P_{c,t-1}$. Three-year price shocks refer to the change in the log price index between years t and $t-3$. "Agricultural" refers to commodities in agriculture, forestry, and fisheries. "Minerals etc." refers to minerals, metals, oil, and gas. The principal agricultural export commodity of country c employed to construct the price index used in column (2) is identified following Caselli and Tesei (2016). The fixed-weight approach in columns (3) and (4) follows Deaton and Miller (1995). See the main text for details.

APPENDIX TABLE 1: Commodity Prices and Civil War in Sub-Saharan Africa

Panel A: Year-on-Year Commodity Price Shocks 1980–2007

Commodity Export Weights	Time-Varying Export Weights	Fixed Export Weights		
		Principal Export Commodity Weight=1	Year 1990	Period Average 1980–2007
	(1)	(2)	(3)	(4)
Year-on-Year Commodity Price Shock t	-0.066	-0.061*	-0.100**	-0.095*
	(0.044)	(0.034)	(0.047)	(0.052)
Year-on-Year Commodity Price Shock $t-1$	-0.023	-0.034	-0.039	-0.038
	(0.034)	(0.025)	(0.037)	(0.038)
Year-on-Year Commodity Price Shock $t-2$	-0.055	-0.061*	-0.083*	-0.087*
	(0.043)	(0.033)	(0.042)	(0.045)
Sum of the Three Commodity Price Effects	-0.144	-0.156*	-0.222**	-0.221**
	(0.088)	(0.072)	(0.088)	(0.104)
Observations	1,007	1,007	1,007	1,007
Countries	45	45	45	45
R^2	0.244	0.249	0.250	0.249

Panel B: Three-Year Commodity Price Shocks 1980–2007

Commodity Export Weights	Time-Varying Export Weights	Fixed Export Weights		
		Principal Export Commodity Weight=1	Year 1990	Period Average 1980–2007
	(1)	(2)	(3)	(4)
Three-Year Commodity Price Shock t	-0.048	-0.052**	-0.073**	-0.073**
	(0.029)	(0.024)	(0.029)	(0.035)
Observations	1,007	1,007	1,007	1,007
Countries	45	45	45	45
R^2	0.243	0.248	0.248	0.246

Panel C: Three-Year Price Shocks 1957–2007

Commodity Export Weights	Time-Varying Export Weights	Fixed Export Weights		
		Principal Export Commodity Weight=1	Year 1980	Period Average 1957–2007
	(1)	(2)	(3)	(4)
Three-Year Commodity Price Shock t	-0.017	-0.015	-0.024*	-0.034*
	(0.013)	(0.011)	(0.014)	(0.017)
Observations	1,805	1,805	1,805	1,805
Countries	45	45	45	45
R^2	0.176	0.176	0.177	0.177

Notes: The results in this table are based on a single commodity price index for agricultural commodities, minerals, metals, oil, and gas. For results differentiating between agricultural commodities on the one hand and minerals, metals, oil, and gas on the other, see Tables 1 and 2. * $p < 0.10$, ** $p < 0.05$. Standard errors in parentheses are clustered at the country level. The left-hand-side variable in all regressions is an indicator variable for civil war onset. All regressions control for country fixed effects, year fixed effects, and country-specific linear time trends. Year-on-year commodity price shocks in t refer to the change in the log of the commodity price index of country c between years t and $t-1$, $\log P_{c,t} - \log P_{c,t-1}$. Three-year price shocks refer to the change in the log price index between years t and $t-3$. The principal export commodity of country c employed to construct the price index used in column (2) is identified following Caselli and Tesei (2016). The fixed-weight approach in columns (3) and (4) follows Deaton and Miller (1995). See the main text for details.

APPENDIX TABLE 2: Global Evidence on Commodity Prices and Civil War

Panel A: Year-on-Year Commodity Price Shocks 1980–2007

Commodity Export Weights	Time-Varying Export Weights	Fixed Export Weights		
		Principal Export Commodity Weight=1	Year 1990	Period Average 1980–2007
	(1)	(2)	(3)	(4)
Year-on-Year Commodity Price Shock t	-0.033	-0.042**	-0.054**	-0.059**
	(0.021)	(0.019)	(0.022)	(0.026)
Year-on-Year Commodity Price Shock $t-1$	-0.003	0.001	-0.009	-0.014
	(0.015)	(0.016)	(0.021)	(0.022)
Year-on-Year Commodity Price Shock $t-2$	-0.026	-0.018	-0.038	-0.041
	(0.021)	(0.018)	(0.023)	(0.025)
Sum of the Three Commodity Price Effects	-0.062	-0.059	-0.100*	-0.114*
	(0.044)	(0.042)	(0.048)	(0.056)
Observations	2,662	2,662	2,662	2,662
Countries	118	118	118	118
R^2	0.248	0.251	0.250	0.250

Panel B: Three-Year Commodity Price Shocks 1980–2007

Commodity Export Weights	Time-Varying Export Weights	Fixed Export Weights		
		Principal Export Commodity Weight=1	Year 1990	Period Average 1980–2007
	(1)	(2)	(3)	(4)
Three-Year Commodity Price Shock t	-0.020	-0.019	-0.033**	-0.037*
	(0.015)	(0.014)	(0.016)	(0.019)
Observations	2,662	2,662	2,662	2,662
Countries	118	118	118	118
R^2	0.248	0.248	0.249	0.249

Panel C: Three-Year Commodity Price Shocks 1957–2007

Commodity Export Weights	Time-Varying Export Weights	Fixed Export Weights		
		Principal Export Commodity Weight=1	Year 1980	Period Average 1957–2007
	(1)	(2)	(3)	(4)
Three-Year Commodity Price Shock t	-0.003	-0.002	-0.014*	-0.014
	(0.008)	(0.006)	(0.008)	(0.009)
Observations	4,781	4,781	4,781	4,781
Countries	118	118	118	118
R^2	0.168	0.168	0.168	0.168

Notes: The results in this table are based on a single commodity price index for agricultural commodities, minerals, metals, oil, and gas. For results differentiating between agricultural commodities on the one hand and minerals, metals, oil, and gas on the other, see Tables 1 and 2. * $p < 0.10$, ** $p < 0.05$. Standard errors in parentheses are clustered at the country level. The left-hand-side variable in all regressions is an indicator variable for civil war onset. All regressions control for country fixed effects, year fixed effects, and country-specific linear time trends. Year-on-year commodity price shocks in t refer to the change in the log of the commodity price index of country c between years t and $t-1$, $\log P_{c,t} - \log P_{c,t-1}$. Three-year price shocks refer to the change in the log price index between years t and $t-3$. The principal export commodity of country c employed to construct the price index used in column (2) is identified following Caselli and Tesei (2016). The fixed-weight approach in columns (3) and (4) follows Deaton and Miller (1995). See the main text for details.