Economic Shocks, Civil War & Ethnicity

Thorsten Janus & Daniel Riera-Crichton

Abstract

We study the non-monotonic effect of economic downturns on civil war onset. Using a novel global panel dataset, we show that declining commodity terms of trade or income growth increases civil war risk significantly in countries with intermediate levels of ethnic diversity. The effect on civil war risk in highly diverse or homogenous societies is negative or insignificant. Given that the size of the largest ethnic group explains 96% of the variation in our ethnic diversity measure, we conjecture that a key problem may be ethnic dominance: countries where the ethnic plurality is large, but not so large it cannot be challenged, may be most vulnerable to economic shocks. Our findings contrast with previous studies that estimate a monotonic effect of economic shocks on civil war. They also help to synthesize the competing views that civil conflict is determined by economic factors and that it is determined by ethnic differences.

Keywords: Civil war, social conflict, ethnic diversity, commodity terms of trade

JEL Classification: D74, O11, O17

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1. Introduction

Civil wars cause death and injury, insecurity, loss and misallocation of assets, and potentially a different trajectory of long-run development. Their international repercussions can include trade disruptions, refugee flows, the rise of criminal and terrorist networks, and impetus for war in neighboring countries (Cerra and Saxena 2008, Blattman and Miguel 2010, World Bank 2011). Unfortunately, while the empirical literature has tested many economic, political, geographic, demographic, regional, and international conflict determinants (Sambanis 2001, Fearon and Laitin 2003, Collier and Hoeffler 2004), few are robust across samples and estimation methods (Hegre and Sambanis 2006). The recent survey by Blattman and Miguel (2010) concludes that the most robust determinants of civil war may be the level and growth rate of income per capita and, perhaps, geographic factors like mountainous terrain. Particularly, the evidence for growth is based on recent studies using rainfall (Miguel et al. 2004) or commodity prices and growth in trading partners (Brückner and Ciccone 2010) to instrument for the growth rate of GDP per capita in civil war regressions.[1] Besley and Persson (2008) and Burke et al. (2009) link commodity prices and temperature directly to conflict, although it is unclear whether growth is the causal mechanism. On the other hand, even among weak states or countries with high levels of social tensions that might be most vulnerable to economic shocks, Bazzi and Blattman (2011) find only weak evidence linking commodity export prices to civil conflict.

In this paper, we contribute to the literature on economic shocks and civil war in three principal ways. First, we expose a non-monotonic effect of economic shocks on civil war:

[1] There are several reasons growth could be endogenous to conflict. First, there could be a reverse causal effect from current or anticipated future conflict on to growth (Miguel et al. 2004). Second, data quality for war-affected countries can be questionable (Heston 1994, Deaton 2005). Third, unobservable factors may affect growth and conflict risk simultaneously.

commodity terms of trade and growth declines are only associated with civil war onset in countries with intermediate levels of ethnic diversity. In highly homogenous or heterogeneous countries, if anything, economic declines *prevent* civil war. We believe this finding may go some way towards synthesizing two rather separate literatures: The first, written primarily by political scientists, argues that ethnicity explains violent conflict (Posen 1993, Gurr and Harff 1994, McGarry and O'Leary 2013). The second, written by economists, argues that economic shocks drive conflict (Angrist and Kugler 2008, Dube and Vargas 2008, Chassang and Padro-I-Miquel 2009). Our findings instead suggest that the interaction between economic shocks and ethnic composition is crucial.

A second important contribution of this paper arises from the use of new and expanded datasets. While previous studies linking income shocks to conflict have focused on sub-Saharan Africa (Miguel et al. 2004, Brückner and Ciccone 2010), we introduce a global panel dataset with civil war, growth and commodity price data. We use this data to study both the direct effect of commodity price shocks on civil war and the indirect effect via income growth. In contrast to Brückner and Ciccone (2010) and Bazzi and Blattman (2011), who measure economic shocks using commodity export prices, we focus on shocks to the ratio of commodity export to commodity import prices. By analogy to the standard terms of trade, we call this price ratio the commodity terms of trade. Rather than export prices, the use of commodity terms of trade to measure shocks may be of importance as most key endogenous variables in open economy macroeconomic models, including net exports, aggregate demand, output, unemployment, real wages, and the fiscal surplus, depend on the terms of trade rather than export prices (Agenor and Montiel 1999).

Finally, we show that the size of the largest ethnic group, or ethnic plurality, explains 96% of the variation in the ethnic diversity measure. We, therefore, conjecture that a key reason for the heterogeneous effect of economic shocks across countries may be ethnic dominance: countries where the ethnic plurality is large enough to threaten others (e.g., above 45 percent of the population) but not so large it cannot be threatened (e.g., below 90 percent of the population) may be most vulnerable to economic shocks. This being said, having an intermediately large ethnic plurality is also a powerful predictor of the ethnic polarization measure defined by Montalvo and Reynal-Querol (2005). Although the concept of ethnic dominance seeks to capture the presence of a single large ethnic group, and that of polarization seeks to capture the presence of two or more sizable groups, the two turn out to be difficult to distinguish in practice. We, nonetheless, conclude that efforts to delink economic downturns from civil war may benefit from focusing on countries with intermediate ethnic diversity, ethnic dominance or high ethnic polarization.

In addition to the empirical civil war literature, the paper relates to the literature linking ethnic diversity to economic outcomes and social conflict (Easterly and Levine 1997, Alesina et al. 2003). While most of this literature tests for a monotonic effect of ethnic diversity, we follow Temple (1998), Collier and Hoeffler (2002, 2004), and Montalvo and Reynal-Querol (2005) in studying the effect of intermediate ethnic diversity levels or particular group size distributions. While all three papers test for a direct effect of ethnicity on social outcomes, we ask how ethnic dominance mediates the effect of terms of trade and economic growth shocks. The fact that the terms of trade and growth are time-varying allows us to estimate a fixed effects panel and, therefore, control for unobserved country heterogeneity in civil war risk. In contrast, papers linking ethnicity directly to conflict are unable to include fixed effects as the standard ethnic

diversity datasets in the literature are not time-varying. In the two papers most closely related to our work, Miguel et al. (2004, Table 5) briefly tests whether ethnic diversity exacerbates the conflict effect of rainfall-induced growth shocks in sub-Saharan Africa, but find no evidence that this is the case. In contrast, Rodrik (1999) finds that external shocks (the standard deviation of terms of trade growth times the international trade-to-GDP ratio) hitting developing countries in the 1970s, were associated with larger future growth declines in countries with high ethnic diversity, high inequality, autocracy, or weak institutions. Our paper differs from both of these studies by documenting a non-linear effect of ethnic diversity: we show that negative economic shocks are only associated with civil war onset in intermediately diverse, and not in highly homogenous or heterogeneous, countries.[2] Nevertheless, we share Rodrik's general view that countries with high social tensions (in our case, an ethnic dominance problem) are more likely to mismanage negative economic shocks and degenerate into redistributive conflict.

In the remainder of the paper, Section 2 reviews some theoretical arguments linking economic shocks to the onset of civil war. Section 3 describes the empirical methodology and data. Section 4 studies the direct effect of commodity terms of trade declines on civil war onset. Section 5 estimates the indirect effect via income growth. In both cases we focus on how the effect of exogenous shocks depends on the presence of an intermediate ethnic diversity level or ethnic dominance. Section 6 concludes and considers policy implications.

[2] Another difference to Rodrik (1999) is that we focus on civil war, while the dependent variable in Rodrik's paper is the change in the future growth rate. It is possible that in highly diverse societies no single ethnic group can hope to control the government and negative economic shocks only cause peaceful rent-seeking, such as corruption and political patronage. With a large number of rent-seeking groups (Shleifer and Vishny 1993) the future growth rate may fall significantly due to the common pool problem even without a civil war.

2. Economic shocks and civil war: a brief theory review

Although we refer to Blattman and Miguel (2010) for a thorough review of the literature, this section briefly reviews some arguments linking economic shocks to civil war. We focus particularly on theories allowing a negative economic shock to increase civil war risk in countries with ethnic dominance, but to have little or a negative effect elsewhere, as we find empirically. First, several papers emphasize an *opportunity cost effect* of productivity growth: a fall in labor productivity may increase the return to redistributive conflict relative to productive effort (Besley and Persson 2008, Chassang and Padro-I-Miquel 2009). Second, potentially, a *rise* in productivity can have a *rent-seeking* effect on conflict: the greater economic "prize" accruing to the winner should strengthen the incentive to fight (Garfinkel and Skaperdas 2007, Dube and Vargas 2008). However, in order for the opportunity cost and rent seeking effects of productivity growth to explain our empirical findings, the rent-seeking effect would have to cancel or dominate the opportunity cost effect precisely in countries lacking ethnic dominance. To briefly and very informally explore this idea, Table 1 provides a breakdown of civil war onsets in our data according to whether the country has a dominant ethnic group. For the purpose of Table 1, we define dominance as the ethnic plurality including 45 to 90 percent of the population. Among the countries without dominance, at least a handful, including Angola, Chad, DR Congo, Indonesia, Liberia, Sierra Leone, and Sudan have fought civil wars over natural resources such as oil and diamonds. If natural resource rents are easy for the winner of conflict to appropriate, then, the rent-seeking incentive to fight may increase substantially when commodity prices boom. On the other hand, the rents contested in ethnic dominance countries, such as Azerbaijan, Burundi, Cambodia, Colombia, El Salvador, Georgia, Nicaragua, Pakistan, Rwanda, and Sri Lanka, may tend to be more land and capital than (non-renewable) natural resource related. If

land and capital returns are harder for the conflict winner to appropriate than natural resource revenues, or land and capital require a sizeable labor input to be productive, then, the rent-seeking incentive to fight may increase less than the opportunity cost during economic expansions. Theoretically, this could explain the negative effect of productivity growth on civil war we find for countries with dominance. However, without country-specific data for both the opportunity cost and rent-seeking benefits of fighting, we are unable to test whether their relative importance varies systematically across dominance and non-dominance countries.

A third mechanism linking productivity to civil conflict may be that productivity gains help agents finance capital inputs to conflict (Collier and Hoeffler 2004). We call this the *financing effect* of productivity growth. This view suggests that increasing commodity prices in resource-dependent economies may increase the opportunity cost of soldiering and attract individuals to peaceful farming or mining activities. However, because the farming or mining revenues may be used to finance conflict inputs, such as rifles, landmines or tanks, there is no guarantee of diminished conflict (Janus 2012). It is widely believed that while diamonds financed weapons purchases in Angola and Sierra Leone in the 1990s, mining, opium and coca may do the same in the eastern DR Congo, Afghanistan and Colombia today. In the context of our paper, suppose that for some reason warring groups' financing constraints tend to be binding in societies lacking ethnic dominance, but not in societies with dominance. Then, the financing effect of productivity growth may dominate the opportunity cost effect in the no-dominance sample, explaining the positive productivity-civil war correlation we find there. Unfortunately, our lack of data on civil war financing methods, and the likelihoods of having a binding financing constraint in dominance relative to no-dominance countries, means we also cannot test the financing effect of productivity growth directly.

Apart from capital, another important expenditure in civil wars may be providing goods and services to win the "hearts and minds" of the civilian population. In guerrilla wars it can also be critical for the government to acquire information from civilians regarding the rebels. Eynde (2011) argues that negative productivity shocks hurt the tax revenues rebels can collect from civilians and make the latter more eager to sell information to the government. However, the rebels can benefit from cheaper rebel recruitment provided they have a funding source that is independent of local labor productivity. Eynde finds evidence for this theory using data from India's Naxalite conflict: rainfall induced declines in labor income is associated with increased rebel violence against the government if and only if the rebels have access to mineral revenues. We, similarly, find a heterogeneous treatment effect of negative income shocks. However, our lack of data on how civil wars are financed means we cannot test whether the heterogeneity comes from differential financing access in societies with and without ethnic dominance. We also suspect that, unlike the localized productivity shocks Eynde studies, the macroeconomic terms of trade and income shocks we study can potentially hit the government's finances as hard as the rebels' finances. For instance, it may become harder for the government to pay civilians for information, maintain its (often corruptible) soldiers' salaries, and provide security and public goods to retain the loyalty of civilians (Berman et al. 2011, Siqueira and Sekeris 2012).

We close this section with a simple model consistent with the non-monotonic effect of economic shocks on the risk of civil war onset we find in the data. For simplicity, the model ignores capital and information inputs to conflict. We further abstract from the rent-seeking effect of productivity growth by studying a short-term productivity shock that does not affect the long-term benefit to whoever wins the conflict. Ignoring the financing and rent-seeking effects of productivity growth allows us to isolate the opportunity cost effect. Moreover, in the paper's

empirical section we measure shocks to productivity with the growth rate of the terms of trade for countries' commodities. Given that these growth rates quickly revert to the (almost zero) sample mean, the temporary shocks they generate seem unlikely to affect long-term wealth.

The model assumes there are two periods and two ethnic groups. Group $i = 1,2$ has population size s_i and initial wealth $R_i \geq 0$. Its assets may include capital, natural resources such as land, water or minerals, and access to public goods, tax collections or foreign aid. Although we focus on the interaction between just two groups, they may inhabit a country with other groups. All individual group members spend their time either fighting or producing $a > 0$ tradable goods which sell on the world market for $p_x > 0$ US dollar or other currency units. Due to Cobb-Douglas preferences they spend a fixed income share α on domestically produced goods and a fixed income share $(1-\alpha)$ on imported goods. The consumer price index (CPI) can therefore be expressed as $p_x^{\alpha} p_m^{1-\alpha}$. The return to working in terms of goods is the income level divided by the CPI or $ap_x / (p_x^{\alpha} p_m^{1-\alpha}) = a(p_x / p_m)^{1-\alpha} \equiv \theta$. An increase in either physical output per unit of labor a or the terms of trade p_x / p_m implies an increase in labor productivity θ.

The timing of the game is as follows. At the beginning of the first period a productivity level θ is realized. Then, group 1 either attacks group 2 or remains peaceful. If it remains peaceful, the wealth distribution does not change and group i consumes θs_i in the first period and R_i in the second period. If group 1 attacks, it devotes $0 < f_1 \leq s_1$ labor units to conflict. Then, group 2 devotes $0 \leq f_2 \leq s_2$ labor units to conflict. Group 1 wins the conflict and the total wealth stock $R_1 + R_2 \equiv R$ with probability $f_1 / (f_1 + f_2)$. Otherwise, group 2 wins the conflict

and all the wealth. In case of conflict, group i consumes its production $\theta(s_i - f_i)$ in the first period and its (potentially zero) wealth in the second period.[3]

The model makes two important simplifications: First, it assumes that conflict settles the wealth distribution permanently. In reality losers from conflict may challenge the winner later on or the act of winning may strengthen the winner and prompt it to conquer more (Powell 2006). However, our one-shot conflict assumption still captures that winning is better than losing. Second, we have only allowed group 1 to attack group 2 and not vice versa. We believe this assumption is plausible since, in practice, social groups favored by the status quo - such as Sinhalese in Sri Lanka, Arabs in Chad and Sudan, Alawites in Syria, whites in Apartheid South Africa, or land-owning elites in Colombia, El Salvador, Indonesia, Nepal or the Philippines - would rather avoid than initiate conflict. The assumptions of perfect information and a stable distribution of power in the absence of conflict (Powell 2006), also ensure that, whenever group 1 has incentive to attack group 2, group 2 would have no such incentive were the order of moves reversed. To see this, note that the expected net benefit from fighting is only positive for group $i = 1,2$ if $(f_i / (f_1 + f_2))(R_1 + R_2) - \theta f_i - R_i > 0$. In case this inequality held for both groups, we could add the two inequalities to get $-\theta(f_1 + f_2) > 0$, which is false. Thus, at most one of the groups has incentive to attack. While we leave a more realistic model to future work, we do not believe that the two-period simplification is crucial.

[3] We refrain from assuming that group 1 is necessarily the rebel group and group 2 the government, because it happens that governments attack or provoke a defensive attack by a subset of their citizens (as arguably in Sudan's Darfur region, the Tamil areas of Sri Lanka, Tibet or the part of the Southern Philippines inhabited by Moros, see Fearon and Laitin (2011)).

Proposition 1 (a) *If neither group's resource constraint binds, $f_i \leq s_i$, is binding, then civil war risk is independent of the opportunity cost of fighting θ. If only group 1's resource constraint binds civil war risk depends positively on the opportunity cost. If the resource constraints of either group 2 or both groups bind civil war risk depends negatively on the opportunity cost.*

Proof: See the appendix

The intuition for Proposition 1 is that when neither group's resource constraint is binding, a lower opportunity cost of time, θ, leads both groups to supply more soldiers in case of conflict. Therefore the total cost of fighting, which we show is $\theta f_i = \theta(R/4\theta) = R/4$, does not depend on θ. Since the total fighting cost does not depend on θ, nor does the incentive to attack. In contrast, when group 1 is resource constrained, it maximizes its labor input to conflict, $f_1 = s_1$. Although a rising opportunity cost of time still increases group 1's total fighting cost, θs_1, it benefits from the fact group 2 decreases its conflict input $f_2(\theta)$, $f_2^{'} < 0$. The associated rise in group 1's likelihood of winning is large enough to encourage it to attack when θ is high. Conversely, when group 2's resource constraint is binding, group 2 benefits most from a rising opportunity cost. Group 1, therefore, prefers attacking when θ is low. Finally, when both groups are resource-constrained in case of conflict, $f_1 = s_1$, $f_2 = s_2$, a rise in θ has no effect on the conflict effort of either side. However, the fact that each unit of conflict effort is more expensive discourages attacking.

Corollary 1 *Assume that dominant ethnic groups are at least as likely to have an attack incentive as smaller groups but are less likely to be resource-constrained in case of conflict. Then economic downturns (including downturns due to terms of trade declines) will promote conflict more in societies with ethnic dominance than in societies without dominance.*

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Corollary 1 follows from the last statement in Proposition 1: if a dominant group is more likely than smaller groups to have an attack incentive, its incentive structure is more likely to mimic that of group 1 than that of group 2 in the model. Since its resource constraint is also less likely to bind, it will be more likely to attack when the opportunity cost of fighting is low and it can better exploit its size advantage. Although it is difficult to measure whether dominant groups have had stronger aggression incentives than smaller groups historically – in Sri Lanka, for instance, one could argue either that Tamils started the country's civil war or that Sinhalese land grabs and discriminatory policies drove them to that point - we think it is reasonable to assume so.[4] In countries with ethnic dominance, such as Chad, Georgia, India, Iran, Kazakhstan, Morocco, Pakistan, the Philippines, Russia, Sri Lanka, Sudan, and Turkey, the dominant group tends to control the central government and is able to design policies that effectively appropriate the resources of smaller groups. In cases where the dominant group does not control the government, as in Apartheid South Africa, Burundi, Iraq, Rhodesia, Syria and parts of Latin America historically, they are prone to attack the controlling groups.

Although the model assumes there is only one input (human labor) to the production and conflict activities, as well as specific functional forms, we believe that the primary insight – that

[4] Another problem with measuring who initiates a civil war is anticipation: knowing that the opponent will attack tomorrow may rationalize attacking today.

economic downturns can have a context-specific effect on civil conflict initiation and a different effect in societies with ethnic dominance than societies without it – can be obtained in more general models. As noted, conflict models with a financing constraint, such as Eynde (2011) and Janus (2012), can similarly make the effect of productivity gains non-linear.

3. Empirical Methodology and Data

In this section, we introduce the methodology and data used to test the effect of economic shocks on the probability of civil war onsets. Section 4 studies shocks to the growth rate of the ratio of commodity export to commodity import prices, which we call the commodity terms of trade. Section 5 studies shocks to income per capita growth. Regressions use annual data from 1974 to 2009 for the 147 countries listed in Table 2. The general structure regresses a dummy variable for civil war onset on (i) the relevant economic shock measure and (ii) the shock measure interacted with indicators of intermediate ethnic diversity or ethnic dominance. The interaction term allows us to test for differential effects of a given shock depending on a country's ethnic configuration. Unless otherwise stated, the regressions include country and year fixed effects, country-specific time trends, and robust standard errors.

Civil War. The main dependent variable is a dummy for civil war onset based on the UCDP/ PRIO (v. 4) Armed Conflict Dataset of Gleditsch et al. (2002) and Themnér & Wallensteen (2011). The associated codebook defines a conflict as (p. 1) "a contested incompatibility that concerns government or territory or both where the use of armed force between two parties results in at least 25 battle-related deaths. Of these two parties, at least one is the government of a state." Since the set of all conflicts includes governments fighting enemies abroad, we focus on the subset classified as internal armed conflict or internationalized internal

armed conflict defined as follows (p. 9): "Internal armed conflict occurs between the government of a state and one or more internal opposition group(s) without intervention from other states…Internationalized internal armed conflict occurs between the government of a state and one or more internal opposition group(s) with intervention from other states (secondary parties) on one or both sides." Following the main body of the civil war literature (Miguel et al. 2004, Blattman and Miguel 2010, Brückner and Ciccone 2010) we define a civil war as an armed conflict with at least 1000 battle deaths per year. Finally, to study the onset rather than incidence of conflict, we define a civil war *onset* as a country-year with civil war unless preceded by civil war the previous year. The resulting dataset for civil war onset is, in our opinion, a mixture of protracted wars with a fluctuating death toll – for instance we count three onsets during Angola's 1975-2002 conflict – and truly new wars, such as Iraq in 2003. The reason we record multiple onsets during protracted conflicts such as Angola's is that the battle deaths criterion for recording a conflict is somewhat mechanical. Even without a peace agreement or victory, if less than 1000 people die in battle in a particular year, no ongoing war is recorded. However, as we show below, using the alternative civil war datasets of Fearon and Latin (2003) and the Correlates of War (COW) Project does not change our empirical findings. Table 3 displays the summary statistics.

Economic Growth and Control Variables. Economic growth is measured as the three year moving average of the difference in logs of real PPP-converted GDP Per Capita (Chain Series) in 2005 US$. The data for real GDP is taken from the Penn World Tables. We also draw data for population, trade openness (the ratio of exports plus imports to GDP) and the ratio of government expenditures to GDP from the same source. Data for Net Official Development Assistance at constant 2008 US$ was obtained from the World Bank Development Indicators.

Democracy measures were found in the Polity IV Project.[5] The democracy index is a weighted average of the competitiveness of political participation, the openness and competitiveness of executive recruitment, and constraints on the chief executive.

Ethnicity. The main dataset for ethnicity is Fearon (2003) who, after discussing the conceptual and practical difficulties of distinguishing ethnic groups, defines a prototypical ethnic group according to seven criteria. The two most important, and the only crucial ones, are common ancestry and a sense of community and self-consciousness as a group (Fearon 2003, p. 201): "Members are conscious of group membership and view it as normatively and psychologically important to them." The other five criteria include sharing distinguishing cultural features, such as language, religion and customs, having or at least "remembering" a homeland, and having a shared, collectively represented and at least partly fact-based history as a group. Our reading of the literature on ethnicity and nationalism (Gellner 1983, Smith 1986) is that Fearon's criteria are widely accepted. Using the CIA World Factbook, Encyclopedia Britannica, Library of Congress Country Studies, and country-specific sources, Fearon codes 822 ethnic groups in 160 countries that meet the seven criteria adequately.

Compared to Fearon (2003), an alternative ethnicity dataset is provided by Alesina et al. (2003), who define ethnicity based on racial and linguistic characteristics. Unlike Fearon, Alesina et al. do not require that ethnic groups have a sense of community or group consciousness. Although the correlation between the ethnic fractionalization measures one can compute for each country in each of the datasets is 0.86, and the data look similar for most countries, we believe that Fearon's requirement of group consciousness is important: in order for ethnic divisions to affect economic behavior, presumably people must care about them. For

[5] See http://www.systemicpeace.org/polity/polity4.htm.

example, in the case of India Fearon distinguishes Hindu-speakers from Bengalis, Tamils, Punjabis and Assamese. In contrast, Alesina et al. distinguish Indo-Aryans from Dravidians. Given that there is no obvious fault line between Indo-Aryans and Dravidians in India, but the minorities listed by Fearon consider themselves distinct from Hindu-speakers, we expect the ethnic divisions identified by Fearon to have a greater effect on civil war risk. Similarly, in Lebanon, Fearon distinguishes the Shii Muslim, Maronite Christians and Sunni Muslim groups (among others), while Alesina et al. distinguish a 93% Arab population from smaller groups such as Armenians and Kurds. Given that Lebanon's politics and both its civil wars (in 1958 and 1975-90) were fought between the religious sects identified by Fearon (as well as other sects and Palestinians) we expect these divisions to matter more than the differences between Arabs and non-Arabs.[6]

As in other empirical studies linking ethnicity to social outcomes (Easterly and Levine 1997, Fearon and Laitin 2003, Collier and Hoeffler 2004), the size or definition of ethnic groups could potentially be endogenous to political and economic variables. For example, people may "fall back" on ethnic networks when formal market and political institutions fail. Although we cannot rule out that ethnicity could be endogenous, we doubt that it is a major problem in this study. First, a social identity like ethnic belonging seems unlikely to change significantly over

[6] A third alternative would be to use the Soviet ethnicity data published in "Atlas Narodov Mira" in 1960. However, partly this dataset only covers 112 countries and partly it codes ethnicity mainly according to linguistic criteria, which can be a poor predictor of actual ethnic fault lines (Fearon 2003, Alesina et al. 2003). For example, it fails to record Burundi's deep Hutu-Tutsi division since the two groups speak the same language. Ashraf and Galor (2011) present a dataset of genetic (rather than ethnic) diversity around the world, but Guedes et al. (2013) question the methodology used to construct this data. Since it is only based on genetic information it also fails to reflect Fearon's group consciousness criterion, which we believe is crucial.

the roughly one generation time-span (1974-2009) of our panel data. Second, our main finding is that negative economic shocks only cause civil war in societies with ethnic dominance, such as an ethnic plurality of 45-90 percent of the population. In order for endogenous ethnicity to explain this, societies that are more vulnerable to economic shocks for reasons unrelated to ethnic dominance must be somehow more likely to have a dominant ethnic group. While this is not entirely implausible,[7] the country fixed effects we include in nearly all regressions control for any time-invariant factors making some countries more vulnerable to shocks. Third, our qualitative results are robust to using the alternative ethnicity dataset of Alesina et al. (2003), which is based solely on racial and linguistic differences, rather than Fearon's (2003) dataset. Both race and language seem particularly unlikely to change over the sample years. Fourth, our reading of the large qualitative literature on ethnicity and conflict suggests that, on the one hand, ethnicity truly seems to matter for political behavior. On the other hand, efforts by politicians to change ethnic boundaries during economic crises or elections are heavily constrained by preexisting social categories (Horowitz 1985, Smith 1986) and by the efforts of competing politicians to make these categories more salient (Chandra 2007, Eifert et al. 2010). We, therefore, follow the large empirical literature on ethnic diversity and social outcomes (Alesina and La Ferrara 2005, Hegre and Sambanis 2006) in treating ethnic divisions as exogenous in the present context.

The main ethnicity measures we extract from Fearon (2003) are the size of the largest ethnic group or ethnic plurality, and the standard Herfindahl-Hirschman index of ethnic diversity of fractionalization: $ef = 1 - \sum_{i=1}^{N} s_i^2$ for a country with N ethnic groups, where s_i is the

[7] For example, mountainous terrain may both give rebels a place to hide (Fearon and Laitin 2003), thus promoting conflict, and promote ethnic distinctions due to geographical barriers.

population share of group i. The *ef* measure ranges from zero for a homogenous country with a single ethnic group to almost unity for a country with many small ethnic groups. We additionally use Fearon's data to compute the ethnic polarization measure of Montalvo and Reynal-Querol (2005), building on Esteban and Ray (1994). The polarization measure, which is computed as $pol = 4\sum_{i=1}^{N} s_i^2(1-s_i)$, differs from the fractionalization measure in the following key respect: while fractionalization increases monotonically if existing ethnic groups subdivide (or fractionalize) into smaller groups, polarization is maximized when there are precisely two equally large groups. The idea is that societies with two equally large groups may be particularly prone to power struggles (Montalvo and Reynal-Querol 2005, Bhavnani and Miodownik 2009).

Commodity Terms of Trade. We build a global commodity terms of trade (CTOT) dataset using the definition of CTOT in Ricci et al. (2008) and the procedure for weighting relative prices proposed in Spatafora and Tytell (2009).[8] The dataset covers the period 1970-2009 and differs from the general terms of trade by only including the prices of commodity exports and imports. By excluding industrial goods and concentrating on commodity prices, we focus on the most volatile, and plausibly exogenous to each country, component of import and export prices. Following Ricci et al. (2008) we define the CTOT for country j in period t as a weighted average price of its main commodity exports to a weighted average price of its main commodity imports:

$$CTOT_{jt} = \prod_i (P_{it} / MUV_t)^{X_j^i} / \prod_i (P_{it} / MUV_t)^{M_j^i},$$

[8] Aizenman et al. (2012) apply a similar CTOT index to predict economic performance.

where P_{it} is a common price index for six commodity categories (food, fuels, agricultural raw materials, metals, gold, and beverages) in year t; X_j^i is country $j's$ average share of exports of commodity i as a percent of GDP from 1970 to 2006; M_j^i is the corresponding average share of imports. The commodity prices are deflated by a manufacturing unit value index (*MUV*). Because X_j^i and M_j^i are averaged over the sample years, the movements in $CTOT_{jt}$ are invariant to changes in export and import volumes in response to civil war or price fluctuations. They, therefore, isolate the impact of commodity prices on the country's commodity terms of trade. In addition, the fact that X_j^i and M_j^i are scaled by GDP rather than trade volumes means that they control for differences in both the composition and the economic importance of commodity trade across countries. Taking the log and then the time derivative of the CTOT index shows that the growth rate of the CTOT is approximately equal to growth in GDP it induces. Even with the same proportional increase in export and import prices, the CTOT index will increase (decrease) if commodity exports constitute a larger (smaller) GDP share than commodity imports (Spatafora and Tytell 2009). We measure CTOT shocks in this paper as the log difference in the three-year moving average of the CTOT index.

4. Reduced Form Results

In column (1) of Table 4, we simply regress civil war on the lagged growth rate of the three-year moving average of the commodity terms of trade. Although the coefficient has the expected sign, it is not significant. Similarly, Bazzi and Blattman (2011) find that the growth rate of commodity prices is a weak predictor of civil war. In column (2), however, we add an interaction between the lagged commodity terms of trade growth rate and a dummy for ethnic diversity in the 25th to

75th percentile. The dummy includes the ethnic diversity range from 0.25 to 0.68. The new estimates imply that a percentage point decline in the terms of trade growth rate is associated with 0.56 percentage points increase in civil war risk in intermediately diverse countries. A decline of two standard deviations (2.4 percentage points) is predicted to increase civil war risk by 1.4 percentage points, almost doubling the sample mean risk of 1.5 percent per year. In contrast, for countries below the 25th or above the 75th percentiles, declining commodity terms of trade are associated, if anything, with *decreased* civil war risk. This being said, the absolute effect is less than half (0.24) of the absolute effect for intermediately diverse countries (-0.56), and with p=0.11 it is insignificant at conventional levels.

Since defining the dummy for intermediate ethnic diversity according to the 25th-75th percentile is somewhat arbitrary, Table 4, column (3) estimates a more flexible quadratic specification. Figure 1 plots the implied marginal effects of a-percentage point decrease in terms of trade growth. As the figure shows, declining terms of trade growth is only associated with increased civil war risk at the 90% confidence level in the ethnic diversity range from 0.3 to 0.64. This amounts to 56/148 or 38% of the sample countries with ethnic diversity data. The point estimates are positive for the broader diversity range from 0.18 to 0.75 or 64% of the sample countries, however. The largest estimated increase in annual conflict risk is 0.56 percentage points, which occurs at a diversity level of 0.47.[9]

Next, we ask why intermediate diverse countries may be more vulnerable to terms of trade shocks. The upper panel in Figure 2 reveals that there is a close linear relationship between

[9] Since no country with ethnic fractionalization below 0.15 or above 0.93 has experienced civil war over the sample years, the quadratic fit may be misleading beyond either extreme. In particular, we doubt the very large decreases in conflict risk predicted for highly homogenous or extreme diverse countries in Figure 3.

ethnic fractionalization and the size of the largest ethnic group or ethnic plurality. A linear regression yields an R^2 of 0.96. However, there is also a close quadratic relationship between fractionalization and ethnic polarization. Regressing polarization on ethnic diversity and its square yields an R^2 of 0.92. As shown in the lower panel of Figure 2, regressing polarization on the ethnic plurality and its square yields a similarly high R^2 of 0.92. Figure 2 suggests that it may be difficult to distinguish the effects of having an intermediate ethnic diversity level, an intermediately large ethnic plurality, or high ethnic polarization.

To explore the issue further, in column (4) of Table 4 we replace ethnic diversity and its square with the size of the ethnic plurality and its square (all terms interacted with commodity terms of trade growth). As expected, the results are highly significant. As illustrated in Figure 3, terms of trade declines are linked to higher civil war risk when the plurality is about 38-89 percent of the population (or with 90% confidence when the plurality is 48-70 percent). Outside that range, a terms of trade decline is estimated to decrease civil war risk. In columns (5)-(7), we test the explanatory power of two additional variables. First, we add an interaction with the size of the second largest ethnic group in the country. Second, we add the interaction of terms of trade growth with the total number of ethnic groups in the country. Potentially, countries with many groups have a greater scope for inter-group clashes. We find no significant evidence that the size of the second-largest ethnic group or the total number of ethnic groups shape the effect of terms of trade declines after controlling for the ethnic plurality. In column (7), we include an interaction between terms of trade growth and a dummy equal to one when the ethnic plurality is in the 45-90 percent range, as well as, the interaction of terms of trade growth with ethnic polarization. Even though the slightly higher significance in the ethnic dominance is representative of the results obtained in several similar regressions we attempted, given the

difficulty of distinguishing ethnic dominance from polarization documented in Figure 2, we hesitate to draw any firm conclusions regarding which factor is more important in mediating economic shocks.[10]

Finally, we note that both, economic shocks and ethnicity have most often been linked to conflict in sub-Saharan Africa (Easterly and Levine 1997, Miguel et al. 2004, Bates 2008a, Brückner and Ciccone 2010). To examine whether the sub-Saharan Africa region is different, or even driving the results in the global sample, column (8) includes two additional interactions terms: an interaction between terms of trade growth and a dummy for sub-Saharan Africa, and a triple interaction between terms of trade growth, ethnic dominance, and the sub-Saharan Africa dummy. We find no evidence that terms of trade shocks or ethnic dominance have different effects in sub-Saharan Africa.

4.1 Robustness of the Reduced Form Results

Tables 5 and 6 test the robustness of the reduced form results. In Table 5, column (1) includes a dummy for having a 45-90 percent ethnic plurality according to the Alesina et al. (2003) rather than the Fearon (2003) data set. Columns (2)-(4) control for several factors which the literature has linked to civil war risk: real GDP per capita (Collier and Hoeffler 2004, Blattman and Miguel 2010), population (Raleigh and Hegre 2009, Brückner 2010), democracy (Rodrik 1999, Mukherjee 2006), trade openness (Magee and Massoud 2011), the ratio of government expenditures to GDP as a measure of state capacity (Fearon and Laitin 2003, Bates 2008b),

[10] Using the Alesina et al. (2003) rather than Fearon et al. (2003) ethnicity data gives similar results: there is again a close relationship between intermediate levels of ethnic fractionalization, ethnic polarization and ethnic dominance. The relationship is also too close to allow us to distinguish the effects of ethnic dominance from those of polarization.

having an intermediate democracy level defined as a polity2 score in [-5,5] (Fearon and Laitin 2003, Bates 2008a, Goldstone et al. 2010), net official foreign aid per capita (Nunn and Qian 2012), and an interaction between commodity terms of trade growth and GDP per capita. The last control accounts for the fact that countries with higher income may be less conflict-prone in response to economic shocks in ways we have not yet controlled for. All the control variables are lagged one period to limit endogeneity. Columns (5)-(8) simply replicate columns (1)-(4) using civil conflict (at least 25 deaths per year) rather than civil war (at least 1000 deaths per year) as the dependent variable. None of these specifications change the qualitative results from the previous sections regarding terms of trade shocks and ethnic dominance.

In Table 6, we include the same controls as in Table 5 (except for the insignificant interaction between terms of trade growth and income per capita), but estimate a conditional fixed effect logit model as well as a probit model instead of a linear probability model.[11] We also estimate both models using three alternative measures of civil war onset. The first is civil war onsets from the Correlates of War project. The second is civil war onsets from Fearon and Laitin (2003). The third is onset of *ethnic* civil wars -a subset of all civil wars - as coded by Fearon and Laitin (2003). The extra requirement is that fighters must mainly be mobilized along ethnic lines. The results show that the alternative estimation techniques and civil war measures leave our previous conclusions unchanged.

In Table 7, we briefly estimate a multinomial logit model with a dependent variable equal to zero in years without a civil war onset according to Fearon and Laitin (2003). The variable equals one when there is a civil war onset, but the war is not ethnic. It equals two in case of an

[11] While the logit model retains the country fixed effects and time trends from earlier, we only include region fixed effects in the probit models to ensure consistent estimates.

ethnic war onset. The set of control variables is the same as in the probit model. The results point to no significant association between commodity terms of trade declines and the onset of non-ethnic wars. Terms of trade declines are negatively associated with ethnic war onset in societies lacking ethnic dominance, while the association with ethnic war onset is positive in societies with dominance. These findings are what we should expect if ethnic dominance is indeed the key mechanism linking terms of trade declines to civil war risk. If countries with ethnic dominance happened to be civil war-prone following terms of trade shocks, but this had nothing to do with ethnic dominance, then, presumably, their civil wars should not be ethnic wars. In other words, the fact that terms of trade declines only increase *ethnic* civil war risk suggests that ethnic dominance does not proxy for some other factor.

5. Instrumental Variables Estimates for Income and Civil War

In this section, we estimate the effect of income growth on civil war by instrumenting the growth rate of GDP per capita with the lagged growth rate of the commodity terms of trade. Like previous studies of the growth-conflict nexus (Miguel et al. 2004, Brückner and Ciccone 2010) and following the advice in Angrist and Pischke (2009), we focus on a linear IV model. Two reasons to prefer the linear model are that, first, if the response to treatment varies across observations, then a linear model alone identifies the average treatment effect on the treated (Imbens and Angrist 1994, Angrist, Imbens and Rubin 1996). We show below that the effect of growth shocks is mediated by ethnic dominance and the treatment effect could, potentially, vary for other reasons (Miguel et al.2004). Second, only the linear IV procedure allows us to include

country fixed effects (Heckman 1981, Katz 2001).[12] In any case, as we show below, the results are robust to using an alternative IV probit model.

Table 8 shows the IV results for the UCDP/PRIO civil war and civil conflict onsets. While some of the first stage test statistics suggest that the instruments are weak, falling below the relevant critical values in Stock and Yogo (2002), the results are remarkably consistent across specifications, as well as consistent with the reduced form results in the previous section. In column (1), we simply regress civil war onset on the instrumented value of growth. One percentage point fall in growth is associated with about 0.8 percentage points increase in civil war risk. In columns (2)-(4) we study the effect of ethnic dominance by interacting terms of trade growth with dummies for having an ethnic plurality of 40-85, 40-90 or 45-90 percent of the population. As expected, growth decreases are only associated with civil war in countries with ethnic dominance. In the dominance sample, each percentage point decline in growth increases the risk of civil war onset by 1.8 to 2.7 percentage points. The mean across the three specifications is 2.2. To put these numbers in perspective, the mean growth coefficient in the civil war onset regressions of Brückner and Ciccone (2010, Tables 4, 5 and 7) is about 0.9. Unlike our paper, these authors do not distinguish between countries with and without ethnic dominance, and their sample is restricted to sub-Saharan Africa. Given their pooling of dominance and non-dominance countries, and the fact that the incidence of ethnic dominance in

[12] Given that we could never reject that the country-specific time trends included in the previous section were jointly equal to zero under the IV procedure, we decided to drop them. The IV-2SLS regressions therefore only include country and year fixed effects.

sub-Saharan Africa is 44%,[13] their 0.9 estimate is close to the (0.44)(2.2) estimate we would expect based on our study.[14]

As a robustness check on the IV estimates, Table 9 estimates an alternative IV probit model using both the UCDP/PRIO civil war measure and the other three civil war onset measures used earlier. None of these alterations change our existing conclusions.

6. Conclusion

This paper has documented a non-monotonic effect of economic downturns on the risk of civil war onset using a novel country panel dataset. Declining commodity terms of trade or economic growth levels increase civil war risk significantly in countries with intermediate levels of ethnic diversity or ethnic dominance. In highly diverse or homogenous societies, or countries without ethnic dominance, if anything, economic declines help to prevent civil war. Although we have emphasized the role of ethnic dominance in mediating economic shocks, we note that it is difficult to distinguish the effects of ethnic dominance from those of ethnic polarization as defined in Montalvo and Reynal-Querol (2005). A more careful assessment of the relative

[13] We obtain this number by averaging dominance incidence for the region across the three dominance measures in Table 8. The global incidence of dominance is 60%.

[14] In another study which does not distinguish between dominance and non-dominance countries, Miguel et al. (2004, Table 6) estimate a growth effect on the risk of civil war onset in sub-Saharan Africa of 2.9 percentage points. While this is much larger than our 0.8 estimate in Table 8 column (1) or the 0.9 mean estimate in Brückner and Ciccone (2010), it may be difficult to compare the three studies: Miguel et al. focus on rainfall-induced rather than commodity price induced growth shocks, on the incidence rather than onset of civil wars (so they only present a single onset IV regression), and their estimations do not include year fixed effects. The growth estimates in all three studies are also surrounded by considerable uncertainty.

importance of the dominance and polarization must await future work, possibly based on the development of time-varying ethnicity data. We, nonetheless, conclude that efforts to delink economic downturns from civil war may benefit from focusing on countries with intermediate ethnic diversity, ethnic dominance or high ethnic polarization.

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Figure 1 Effect of One Percentage Point Decline in Commodity Terms of Trade Growth on the Risk of Civil War Onset as Ethnic Fractionalization Varies

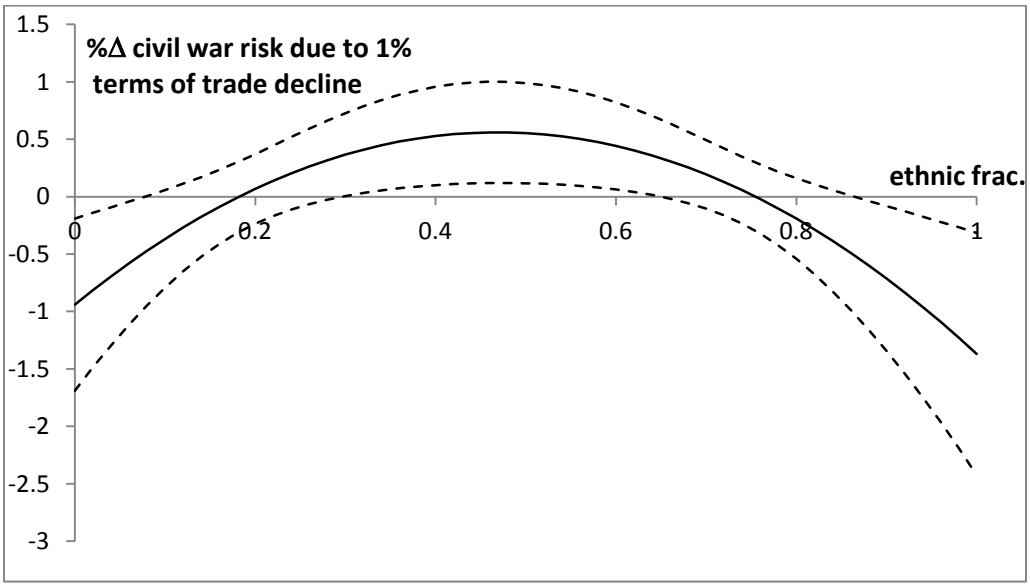
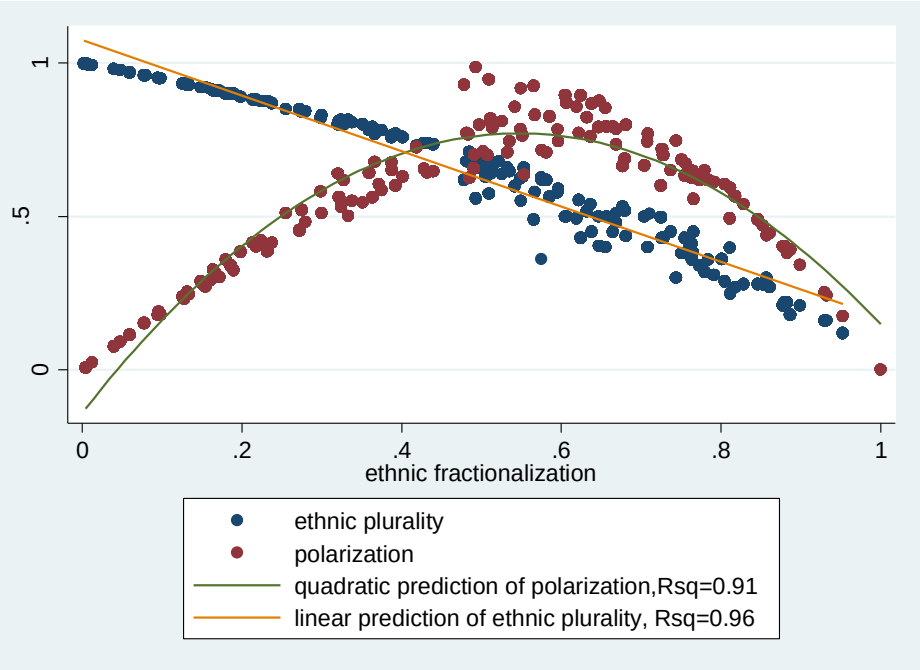


Figure 2 The Close Relationship Between Ethnic Fractionalization, Ethnic Polarization and the Ethnic Plurality



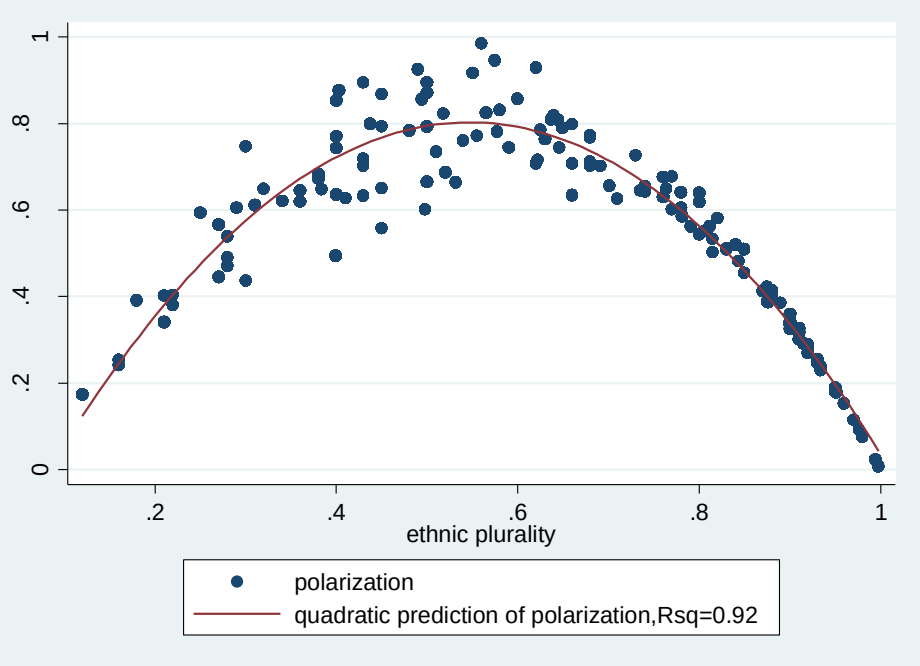


Figure 3 Effect of 1% Commodity Terms of Trade Growth on the Risk of Civil War Onset as the Population Share of the Ethnic Plurality Varies

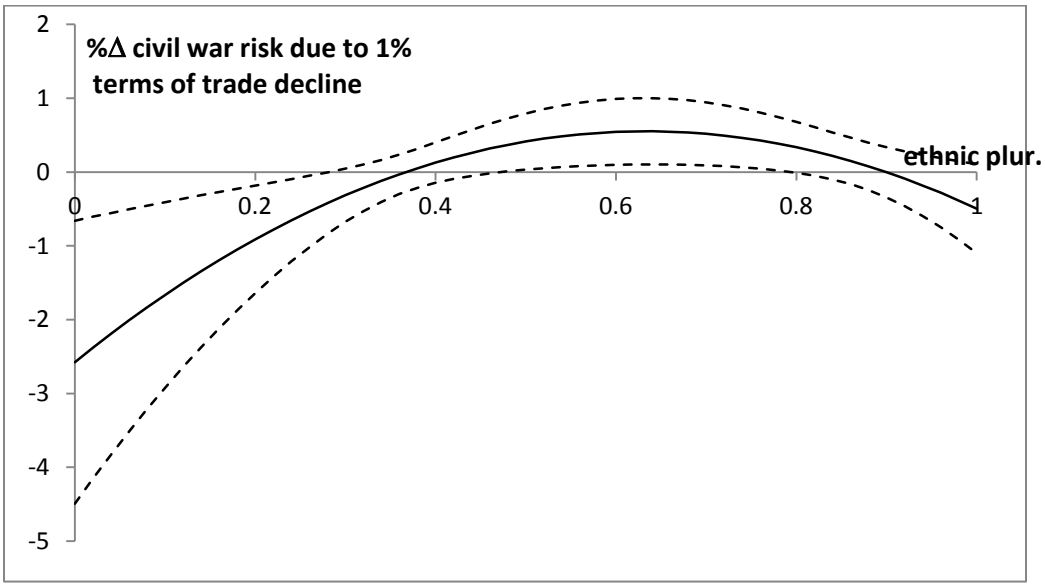


Table 1 Civil War Onsets by Ethnic Dominance Status

War onset without ethnic dominance				War onset with ethnic dominance			
name	**year**	**name**	**year**	**name**	**year**	**name**	**year**
Afghanistan	1978	Liberia	1990	Algeria	1993	Pakistan	1974
Afghanistan	2005	Liberia	2003	Azerbaijan	1992	Pakistan	2008
Angola	1975	Mozambique	1981	Burundi	1998	Russia	1995
Angola	1992	Nigeria	1967	Burundi	2000	Russia	1999
Angola	1998	Peru	1983	Cambodia	1967	Russia	2004
Bosnia & Herzegovina	1992	Peru	1988	Cambodia	1970	Rwanda	1990
Cameroon	1960	Philippines	1950	Cambodia	1978	Rwanda	1994
Chad	1978	Philippines	1978	Cambodia	1989	Rwanda	1998
Chad	1987	Philippines	1981	Colombia	1994	Rwanda	2001
Chad	1990	Philippines	1990	Colombia	2001	Rwanda	2009
Chad	2006	Philippines	2000	Colombia	2004	Serbia	1991
China	1956	Sierra Leone	1998	Cuba	1958	Serbia	1998
China	1959	Somalia	1988	El Salvador	1981	Sri Lanka	1971
Congo, Dem. Rep.	1964	Somalia	1990	France	1961	Sri Lanka	1987
Congo, Dem. Rep.	1996	Somalia	2007	Georgia	1993	Sri Lanka	1989
Congo, Republic of	1997	South Africa	1978	Iran	1979	Sri Lanka	2006
Ethiopia	1975	South Africa	1980	Iraq	1961	Syria	1982
Ethiopia	1987	South Africa	1986	Iraq	1965	Tajikistan	1992
India	1950	Sudan	1963	Iraq	1969	Turkey	1992
India	1988	Sudan	1983	Iraq	1974	United States	2001
India	1999	Sudan	1995	Iraq	1988	Zimbabwe	1976
Indonesia	1950	Sudan	2006	Iraq	2004		
Indonesia	1953	Uganda	1979	Israel	1982		
Indonesia	1958	Uganda	1981	Laos	1959		
Indonesia	1961	Uganda	1996	Laos	1963		
Indonesia	1975	Uganda	2002	Morocco	1979		
Indonesia	1981	Uganda	2004	Nepal	2002		
Lebanon	1958			Nicaragua	1978		
Lebanon	1976			Nicaragua	1983		
Lebanon	1984			Pakistan	1971		

Note: In Table 1, ethnic dominance is defined as having an ethnic plurality of 45 to 90 percent of the population. This is true for 56% of the sample countries.

Table 2 Sample Countries

Afghanistan	Congo, Dem. Rep.	Honduras	Mexico	Slovenia
Albania	Costa Rica	Hungary	Moldova	Somalia
Algeria	Cote d`Ivoire	India	Mongolia	South Africa
Angola	Croatia	Indonesia	Morocco	Spain
Argentina	Cuba	Iran	Mozambique	Sri Lanka
Armenia	Cyprus	Iraq	Namibia	Sudan
Australia	Czech Republic	Ireland	Nepal	Swaziland
Austria	Denmark	Israel	Netherlands	Sweden
Azerbaijan	Djibouti	Italy	New Zealand	Switzerland
Bahrain	Dominican Rep.	Jamaica	Nicaragua	Tajikistan
Bangladesh	Ecuador	Japan	Niger	Tanzania
Belarus	Egypt	Jordan	Nigeria	Thailand
Belgium	El Salvador	Kazakhstan	Norway	Togo
Benin	Eritrea	Kenya	Oman	Trinidad &Tobago
Bhutan	Estonia	South Korea	Pakistan	Tunisia
Bolivia	Ethiopia	Kuwait	Panama	Turkey
Bosnia & Herzegovina	Fiji	Kyrgyzstan	Papua New Guinea	Turkmenistan
Botswana	Finland	Laos	Paraguay	Uganda
Brazil	France	Latvia	Peru	Ukraine
Bulgaria	Gabon	Lebanon	Philippines	U.A.E.
Burkina Faso	Gambia, The	Lesotho	Poland	United Kingdom
Burundi	Georgia	Liberia	Portugal	United States
Cambodia	Germany	Libya	Romania	Uruguay
Cameroon	Ghana	Lithuania	Russia	Venezuela
Canada	Greece	Madagascar	Rwanda	Vietnam
Central Afr. Rep.	Guatemala	Malawi	Saudi Arabia	Zambia
Chad	Guinea	Malaysia	Senegal	Zimbabwe
Chile	Guinea-Bissau	Mali	Sierra Leone	
China	Guyana	Mauritania	Singapore	
Colombia	Haiti	Mauritius	Slovak Rep.	

Table 3 Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Civil War Onset	4911	0.015476	0.123447	0	1
Civil Conflict Onset	4911	0.040318	0.196723	0	1
Real GDP per Capita Growth	4942	0.016796	0.04866	-0.48489	0.312689
ΔCommodity Terms of Trade	4942	0.00043	0.012193	-0.07931	0.110724
EF (FEARON)	4942	0.481511	0.26534	0.003996	1
EF (ALESINA)	4888	0.46419	0.26083	0.001998	0.930175
Plural (FEARON)	4905	0.639804	0.24287	0.12	0.998
Plural (ALESINA)	4942	0.647732	0.241583	0.178	0.999
Real GDP per Capita	4942	8468.278	10132.19	117.2273	56414.26
Trade Openness	4942	0.696987	0.460437	0.01035	4.431754
Population ('000)	4992	37373.5	126609.1	188.75	1323592
Foreign Aid per Capita	3941	0.070022	0.113298	-0.03756	1.997873
Democracy	4579	1.411444	7.363804	-10	10
Government Expenditure/GDP	4942	0.110121	0.070241	0.008958	0.585881

Note: Civil war and civil conflict onsets are from the UCDP/ PRIO (v. 4) Armed Conflict Dataset of Gleditsch et al. (2002) and Themnér & Wallensteen (2011). Real GDP per Capita (in constant 2005 PPP US$), the ratio of government expenditures to GDP, trade openness (the ratio of exports plus imports to GDP) and population are from the Penn World Tables. EF (Fearon) and Plural (Fearon) are ethnic fractionalization and the population share of the largest ethnic group from Fearon (2003). EF (Alesina) and Plural (Alesina) are the last two variables taken from Alesina et al. (2003). Data for foreign aid is Net Official Development Assistance at constant 2008 US$ from the World Development Indicators. The data sources and construction of the commodity terms of trade index is detailed in the text of the paper and the appendix.

Table 4 Reduced Form Results for Civil War

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	WAR ONSET	**WAR ONSET**	**WAR ONSET**	**WAR ONSET**	**WAR ONSET**	**WAR ONSET**	**WAR ONSET**	**WAR ONSET**
ΔTerms of Trade	-0.191	0.245	0.940**	2.575**	2.696**	1.872	0.696	0.013
	[0.133]	[0.152]	[0.457]	[1.168]	[1.163]	[1.343]	[0.459]	[0.127]
ΔToT * EF Dummy		-0.807***						
		[0.296]						
ΔToT* EF			-6.403**					
			[2.694]					
ΔToT * EF^2			6.834**					
			[2.856]					
ΔToT * Plural				-9.872**	-9.915*	-8.699*		
				[4.451]	[5.035]	[4.457]		
ΔToT * Plural^2				7.794**	7.759*	7.189**		
				[3.571]	[4.301]	[3.497]		
ΔToT * Second					-0.42			
					[1.738]			
ΔToT * NumGrps						0.046		
						[0.055]		
ΔToT * Polarization							-1.014	
							[0.740]	
ΔToT* Plural4590							-0.496*	-0.521*
							[0.297)	[0.315]
ΔToT *SSAfrica								0.347
								[0.302]
ΔToT* Plural4590*SSAfrica								-0.165
								[0.462]
Observations	5421	4976	4976	4941	4725	4941	4888	4941
Number of Countries	161	148	148	147	141	147	145	147

Note: Robust standard errors in brackets.* significant at 10%; ** significant at 5%; *** significant at 1%. All explanatory variables are lagged one year.

Table 5 Robustness of Reduced Form Results I

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	WAR ONSET	**WAR ONSET**	**WAR ONSET**	**WAR ONSET**	**CONFLICT ONSET**	**CONFLICT ONSET**	**CONFLICT ONSET**	**CONFLICT ONSET**
ΔTerms of Trade	0.102	0.193	0.182	0.339	0.233	0.736	0.748	1.198
	[0.097]	[0.205]	[0.207]	[0.708]	[0.201]	[0.448]	[0.453]	[1.061]
ΔToT * Plural4590 (Alesina)	-0.493**				-0.601*			
	[0.243]				[0.330]			
ΔToT* Plural4590		-0.666*	-0.656*	-0.659*		-1.048*	-1.058*	-1.065*
		[0.370]	[0.370]	[0.375]		[0.600]	[0.608]	[0.606]
Log RGDP per Capita		0.032	0.033	0.033		0.067**	0.067**	0.066**
		[0.020]	[0.020]	[0.020]		[0.031]	[0.031]	[0.031]
Log Population		0.04	0.042	0.041		0.06	0.059	0.057
		[0.096]	[0.095]	[0.095]		[0.103]	[0.103]	[0.105]
Trade Openness		-0.003	-0.003	-0.003		0.058***	0.057***	0.057***
		[0.010]	[0.010]	[0.010]		[0.020]	[0.020]	[0.020]
Gov Expenditures/GDP		-0.092	-0.095	-0.094		-0.008	-0.005	-0.005
		[0.142]	[0.143]	[0.143]		[0.138]	[0.137]	[0.137]
Foreign Aid per Capita		-0.018	-0.017	-0.016		0.031	0.03	0.032
		[0.026]	[0.026]	[0.026]		[0.039]	[0.039]	[0.039]
Democracy		0.0001				-0.0003		
		[0.001]				[0.002]		
Intermediate Democracy			0.006	0.006			-0.005	-0.005
			[0.011]	[0.011]			[0.016]	[0.016]
ΔToT* Log RGDP per Capita				-0.023				-0.066
				[0.090]				[0.128]
Observations	5349	3535	3535	3535	5349	3535	3535	3535
Number of Countries	159	118	118	118	159	118	118	118

Note: Robust standard errors in brackets.* significant at 10%; ** significant at 5%; *** significant at 1%. All explanatory variables are lagged one year. Alesina refers to ethnic plurality data extracted from Alesina et al (2003). Intermediate democracy is a dummy equal to one for democracy scores in the [-5,5] range on the [-10,10] democracy scale.

Table 6 Robustness of Reduced Form Results II

	FIXED EFFECTS CONDITIONAL LOGIT MODEL				PROBIT MODEL			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	WAR ONSET	COW ONSET	FL ONSET	ETH ONSET	WAR ONSET	COW ONSET	FL ONSET	ETH ONSET
Terms of trade	6.941	18.464	181.055**	169.529*	0.863	3.422	14.698	13.305
	[40.817]	[19.723]	[74.072]	[87.788]	[4.941]	[5.720]	[8.993]	[10.833]
ΔToT * Plural4590	-83.995*	-45.640*	-219.330***	-338.964***	-13.401*	-13.396*	-18.830*	-20.683*
	[48.809]	[25.050]	[80.055]	[124.578]	[6.941]	[7.088]	[10.335]	[12.214]
Log RGDP per Capita	2.492*	-0.086	7.639***	6.860*	0.022	-0.056	-0.099	-0.031
	[1.338]	[0.919]	[2.947]	[3.556]	[0.072]	[0.074]	[0.099]	[0.120]
Log Population	4.727	4.313	9.096	14.862**	0.106**	0.121***	0.067	0.138**
	[5.164]	[4.234]	[6.714]	[7.369]	[0.042]	[0.042]	[0.053]	[0.068]
lanoc	0.464	1.103***	0.469	0.942	0.364***	0.444***	0.328**	0.329**
	[0.456]	[0.427]	[0.657]	[0.846]	[0.114]	[0.101]	[0.133]	[0.164]
Trade Openness	-0.104	-0.957	2.802	1.528	-0.633**	-0.236	-0.739***	-0.723***
	[1.218]	[0.691]	[2.766]	[3.057]	[0.247]	[0.178]	[0.216]	[0.249]
Gov Expenditures/GDP	-0.298	-0.78	15.163	27.593*	1.986***	1.363***	1.346**	1.494**
	[5.631]	[4.901]	[12.172]	[15.395]	[0.549]	[0.507]	[0.590]	[0.642]
Net Official Aid per Capita	-4.617	6.5	-1.255	0.776	-0.989	-2.896**	-0.268	0.297
	[4.200]	[5.388]	[6.152]	[7.262]	[1.063]	[1.312]	[0.566]	[0.574]
Eastern Europe					-0.298	-0.295	-0.335	-0.131
					[0.260]	[0.239]	[0.323]	[0.336]
Sub-Saharan Africa					-0.11	-0.024	-0.447*	-0.044
					[0.199]	[0.192]	[0.244]	[0.282]
Asia					-0.099	-0.182	-0.381	-0.303
					[0.205]	[0.196]	[0.239]	[0.266]
Latin America					-0.511**	-0.485***	-0.748***	
					[0.204]	[0.183]	[0.248]	
Observations	1072	1362	899	726	2869	3056	2070	1411
Number of Countries	32	41	37	30				
Pseudo R-Squared	0.286	0.29	0.44	0.492	0.131	0.139	0.123	0.125

Note: Robust standard errors in brackets.* significant at 10%; ** significant at 5%; *** significant at 1%. All explanatory variables are lagged one year.

Table 7 Robustness of Reduced Form Results III

MULTINOMIAL LOGIT MODEL	Non-ethnic war	Ethnic war
ΔTerms of trade	16.152	33.434*
	[20.251]	[18.987]
ΔToT * Plural4590	-7.661	-53.518**
	[28.068]	[23.084]
Log RGDP per Capita	-0.663*	-0.085
	[0.363]	[0.291]
Log Population	-0.290*	0.268*
	[0.176]	[0.147]
lanoc	0.705	0.573
	[0.592]	[0.368]
Trade Openness	-2.025*	-1.876***
	[1.155]	[0.622]
Share Gov Expenditures	0.587	2.752**
	[3.163]	[1.353]
Official Aid per Capita	-5.987	0.72
	[7.622]	[1.224]
Eastern Europe	-17.481***	-0.306
	[0.636]	[0.874]
Latin America	-0.954	-16.532***
	[0.764]	[0.542]
Sub-Saharan Africa	-18.600***	-0.07
	[0.955]	[0.733]
Asia	-1.659*	-0.489
	[1.002]	[0.680]
Observations	2,441	2,441

Note: Robust standard errors in brackets.* significant at 10%; ** significant at 5%; *** significant at 1%. All explanatory variables are lagged one year. Outcome 0=no war, 1=non-ethnic war, 2=ethnic war.

Table 8 Instrumental Variables Estimates

	War Onset	War Onset	War Onset	War Onset	Conflict Onset	Conflict Onset	Conflict Onset	Conflict Onset
Growth	-0.797*	0.301	0.186	0.051	0.127	1.388*	1.766*	1.291*
	[0.439]	[0.433]	[0.479]	[0.406]	[0.622]	[0.797]	[0.969]	[0.775]
Growth * Plural4085		-2.221**				-2.252*		
		[1.126]				[1.356]		
Growth * Plural4090			-1.829*				-2.67**	
			[0.986]				[1.340]	
Growth * Plural4590				-2.673*				-3.136*
				[1.500]				[1.624]
Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	5206	4759	4759	4759	5206	4759	4759	4759
Number of countries	161	147	147	147	161	147	147	147
Underidentification test: Kleibergen-Paap rk LM statistic								
	22.702	7.658	9.215	5.071	22.702	7.658	9.215	5.071
Chi-sq P-val	0.000	0.006	0.002	0.024	0.000	0.006	0.002	0.024
Weak identification test: Kleibergen-Paap rk Wald F statistic								
	24.369	4.159	4.992	2.823	24.369	4.159	4.992	2.823
Maximal IV Size				10%	15%	20%	25%	
Stock-Yogo weak ID test critical values 1 variable				16.38	8.96	6.66	5.53	
Stock-Yogo weak ID test critical values 2 variables				7.03	4.58	3.95	3.63	
First Stages LSDV	**Growth**	**Growth**	**Growth**	**Growth**	**Growth Plural 4085**	**Growth Plural 4090**	**Growth Plural 4590**	
ΔTerms of trade	0.252***	0.495***	0.453***	0.375**	-0.019	-0.031	-0.047**	
	[0.068]	[0.152]	[0.146]	[0.153]	[0.033]	[0.041]	[0.021]	
ΔToT * Plural4085		-0.324*			0.226**			
		[0.176]			[0.101]			
ΔToT * Plural4090			-0.257			0.253**		
			[0.173]			[0.104]		
ΔToT * Plural4590				-0.195			0.242**	
				[0.178]			[0.098]	
Observations	5290	4783	4783	4783	4783	4783	4783	
Number of countries	162	147	147	147	147	147	147	

Note: Robust standard errors in brackets.* significant at 10%; ** significant at 5%; *** significant at 1%. All Explanatory variables are lagged one year. Plural DummyXXYY is a dummy for largest ethnic group in the XX-YY range. LSDV refers to the first-stage least squares dummy variable regressions.

Table 9 IV Probit Estimates

	War Onset	FL Onset	COW Onset	Ethnic Onset	War Onset	FL Onset	COW Onset	Ethnic Onset
Sample	**If Plural 4590=0**				**IF Plural4590==1**			
Growth (t)	-1.723	10.221	0.773	9.487	-24.800***	-22.079***	-23.695***	-22.219***
	[7.713]	[6.385]	[7.315]	[6.242]	[1.370]	[2.869]	[0.890]	[2.808]
Region Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1442	918	1439	757	1714	1122	2003	724
Wald Exogeneity Test	0.033	2.192	0.439	2.015	6.301	1.75	2.281	3.132
P-Value	0.855	0.139	0.508	0.156	0.012	0.186	0.131	0.077
First Stage LSDV	**Growth**	**Growth**	**Growth**	**Growth**	**Growth**	**Growth**	**Growth**	**Growth**
ΔTerms of trade	0.476***	0.497***	0.570***	0.561***	0.162*	0.15	0.077	0.303
	[0.156]	[0.179]	[0.146]	[0.213]	[0.096]	[0.148]	[0.111]	[0.209]

Note: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. Errors are clustered by country. Plural Dummy is a dummy for largest ethnic group in the range specified at the top. LSDV refers to the first-stage least squares dummy variable regressions.

Proof of Proposition 1

If group 1 does not rebel the payoffs are

$$u_1^p = \theta s_1 + R_1 \quad \text{(a1)}$$

$$u_2^p = \theta s_2 + R_2 . \quad \text{(a2)}$$

The expected payoffs to rebelling are

$$u_1^r = \theta(s_1 - f_1) + (f_1 \,/\, (f_1 + f_2))R \quad \text{(a3)}$$

$$u_2^r = \theta(s_2 - f_2) + (f_2 \,/\, (f_1 + f_2))R, \quad \text{(a4)}$$

Case 1: The resource constraints are not binding Using backward induction, if the resource constraints $f_i \le s_i,\ i = 1,2$ are not binding in the third stage, group 2 solves

$$\partial u_2^r / \partial f_2 = -\theta + (f_1 \,/\, (f_1 + f_2))^2 R = 0 \quad \text{(a5)}$$

$$\Leftrightarrow f_2 = (f_1 R / \theta)^{0.5} - f_1 . \quad \text{(a6)}$$

In the second stage group 1 internalizes group 2's reaction function (5). It therefore solves

$$\max_{f_1} \theta(s_1 - f_1) + f_1 \,/\, (f_1 + f_2) R = \max_{f_1} \theta(s_1 - f_1) + (f_1 \theta R)^{0.5} \quad \text{(a7)}$$

Solving (a7) and substituting the solution into (a6) yields the equilibrium conflict efforts

$$f_1^* = R/4\theta. \quad \text{(a8)}$$

$$f_2^* = R/4\theta. \quad \text{(a9)}$$

In the first stage, group 1 prefers fighting if the rebellion payoff (a3) exceeds the peace payoff (a1):

$$u_1^r - u_1^p = \left(\theta(s_1 - R/4\theta) + R/2\right) - (\theta s_1 + R_1) > 0 \Leftrightarrow R/4 = (R_1 + R_2)/4 > R_1 \Leftrightarrow$$

$$R_1/R_2 < 1/3. \quad \text{(a10)}$$

Case 2: Only group 1's resource constraint is binding If only group 1's resource constraint is binding it sets $f_1 = s_1 < f_1^*$. From (a6),

$$f_2 = (s_1 R/\theta)^{0.5} - s_1. \quad \text{(a11)}$$

Using (a3) and (a1), group 1 will attack whenever

$$u_1^r - u_1^p = (f_1 / (f_1 + f_2))R - (\theta s_1 + R_1) = \left(s_1 / \left((s_1 R/\theta)^{0.5} - s_1 + s_1\right)\right)R - (\theta s_1 + R_1) > 0 \Leftrightarrow$$

$$(s_1 \theta R)^{0.5} - \theta s_1 - R_1 > 0. \quad \text{(a12)}$$

The left hand side of (a12) increases in the opportunity cost of fighting if

$$\partial\left((s_1\theta R)^{0.5} - \theta s_1 - R_1 > 0\right)/\partial\theta > 0 \Leftrightarrow s_1 < R/4\theta = f_1^*,$$

which is true by definition when only group 1's resource constraint binds (i.e., when $f_1 = s_1 < f_1^*$).

Case 3: Only group 2's resource constraint is binding If instead group 2's resource constraint is binding, $s_2 < f_2^*$, then group 2 sets $f_2 = s_2$. In the prior stage group 1 solves

$$\max_{f_1} \theta(s_1 - f_1) + f_1 \,/\, (f_1 + s_2) R \Rightarrow \tag{a13}$$

$$f_1 = (s_2 R/\theta)^{0.5} - s_2. \tag{a14}$$

Again substituting into (a3) and (a1) shows that group 1 rebels whenever

$$\theta(s_1 - (s_2 R/\theta)^{0.5} + s_2) + \frac{(s_2 R/\theta)^{0.5} - s_2}{(s_2 R/\theta)^{0.5}} R \geq \theta s_1 + R_1 \Leftrightarrow \tag{a15}$$

$$-2(s_2\theta R)^{0.5} + \theta s_2 + R - R_1 > 0 \tag{a16}$$

A fall in the cost of fighting θ promotes conflict if $\partial\theta\left(-2(s_2\theta R)^{0.5} + \theta s_2 + R - s_1\right) < 0$ or $s_2 < R/\theta$, which is true by definition when only group 2's resource constraint binds (i.e., when $s_2 < f_2^* = R/4\theta$).

Case 4: Both resource constraints are binding If both resource constraints are binding, then $f_1 = s_1$ and $f_2 = s_2$. By (a3) and (a1) group 1 will attack whenever

$$u_1^r - u_1^p = (s_1 / (s_1 + s_2))R - (\theta s_1 + R_1) > 0 \Leftrightarrow$$

$$(s_1 / (s_1 + s_2))R - R_1 - \theta s_1 > 0. \qquad \text{(a17)}$$

Condition (a17) is less likely to hold the higher is θ, so a rising opportunity cost of fighting deters conflict.□