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Beyond greed and grievance: feasibility and civil war

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Civil war is the most prevalent form of large-scale violence and is massively destructive to life, society, and the economy. The prevention of civil war is therefore a key priority for international attention. We present an empirical analysis of what makes countries prone to civil war. Using a global panel data set we examine different determinants of civil war for the period 1960–2004. We find little evidence that motivation can account for civil war risk but we suggest that there is evidence to support our feasibility hypothesis: that where a rebellion is financially and militarily feasible it will occur.

JEL classifications: O10, D74.

1. Introduction

Over the past half-century civil war has replaced international war as the most prevalent form of large-scale violence. Once started, civil wars are hard to stop: they persist for more than ten times as long as international wars. Their consequences are usually dire, being massively destructive to the economy, to the society, and to life itself. The prevention of civil war is therefore rightly seen as one of the key priorities for international attention. Informed strategies of prevention must rest upon an analysis of what makes situations prone to civil war. Precisely because in any particular violent conflict the issue is highly politicized, with supporters of each side proffering a litany of self-serving explanations, the public discourse is hopelessly contaminated by advocacy. The issue is thus particularly well-suited to statistical analysis of global data. This approach both abstracts from any particular conflict and subjects the researcher to the discipline of statistical method.

This approach to establishing the factors which make a country prone to civil war was pioneered in Collier and Hoeffler (1998, 2004). Since those papers, the literature, the data, and our own thinking have all advanced considerably. In the present paper we revisit the issue, replicating, overturning, and extending our earlier results.

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The foundation for serious quantitative analysis of civil war was laid by political scientists at the University of Michigan, the university that pioneered much quantitative political analysis, who carefully built a comprehensive global data set on civil wars, the Correlates of War project (COW). Using this data set, its variants and now its rivals, economists and political scientists have begun to analyse the factors that might account for the onset of conflict (Collier and Hoeffler, 1998, 2004; Fearon and Laitin, 2003; Miguel *et al.*, 2004). Quantitative analysis based on global data sets has its own severe limitations imposed by data constraints and so should be seen as complementing qualitative in-country research rather than supplanting it. As data constraints are periodically relaxed so opportunities for better quantitative analysis are opened. The present paper uses such an opportunity, aspiring to be definitive conditional upon the recent quantum expansion in data, both for the dependent and independent variables, in respect of quality, quantity, and timeliness. One reason for a quantum expansion in the data for our analysis is an artefact of our dependent variable: the risk of civil war during a five-year period. Our previous analysis closed in December 1999 and we are now able to include a further five years. Since 2000 there has been a shift towards international intervention, notably the United Nations policy of a 'responsibility to protect' (Evans and Sahnoun, 2002) and the replacement of the Organization of African Unity, with its principle of 'non-interference', by the African Union with its principle of 'non-indifference'. These shifts in sentiment were reflected in an increase in the number of settlements of civil war that was sufficiently dramatic to suggest a significant break with past behaviour. Hence, it is of particular interest to investigate whether there was a corresponding significant change in the incidence of civil war onsets. There have also been striking advances in the quantification of potential explanatory variables. These enable us to investigate a new range of social and political variables. Using the technique of stepwise deletion of insignificant variables we arrive at a provisional core regression in which all terms are significant. We then conduct specification tests to ensure that no additional significant variable can be added. The resulting regression has a reasonable claim to be the best characterization of the data. Since we adopted this same approach in our previous study, albeit on substantially inferior data, a comparison of our results from the two studies provides some indication of how robust the present results are likely to prove to further inevitable improvements and innovations in data sets.

Our own thinking on proneness to civil war has also evolved. As implied by the title 'greed and grievance', our previous paper was still rooted in the traditional focus on the motivation for rebellion. Since then our work has increasingly called into question whether motivation is as important as past emphasis upon it had implied (Collier and Hoeffler, 2007). Instead of the circumstances which generate a rebellion being distinctive in terms of motivation, they might be distinctive in the sheer financial and military feasibility of rebellion. We have formulated this into the 'feasibility hypothesis': that where a rebellion is feasible it will occur. While in this paper the spirit of our empirical analysis is to provide a comprehensive investigation of the factors that make a country prone to civil war rather than to test a single

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hypothesis, along the way we will investigate whether the feasibility hypothesis can be disconfirmed.

In Section 2 we set out the theoretical framework for our analysis. By combining motivation and opportunity, our framework encompasses a range of political science analyses which stress various types of motivation, and economic analyses some of which focus on motives while others focus on opportunities. In Section 3 we discuss the data, focusing upon the major expansions and revisions since our previous article. In Section 4 we report our results. Although our previous results are broadly confirmed, we find three new variables to be significant. Not only are these three variables important in their own right, they provide a somewhat firmer basis for discriminating between theories. Section 5 concludes with a discussion of the implications for policy towards promoting civil peace.

2. The economic theory of civil war

Just as the quantitative study of civil war has evolved rapidly, so has its analysis using standard applications of economic theory.[1] Whereas traditional political analyses either assumed or asserted some particular 'root cause' of civil war, usually traced to a historical grievance, modern economic theory focuses on the feasibility of rebellion as well as its motivation. The defining feature of a civil war is large scale organized violence on the part of a rebel army. This is not meant to imply that the rebel side is to blame, but rather that since virtually all governments maintain standing armies, the distinctive feature of civil war is the existence of a non-government army. In most circumstances the establishment of a rebel army would be both prohibitively expensive and extremely dangerous regardless of its agenda. The relatively rare circumstances in which rebellion is financially and militarily feasible are therefore likely to constitute an important part of any explanation of civil war. Hirshleifer (2001), who pioneered much of the analytic research on conflict, proposed the Machiavelli Theorem, that no profitable opportunity for violence would go unused. Our variant of this theorem, the feasibility hypothesis, proposes that where rebellion is materially feasible it will occur. This can be expressed as the following, empirically testable hypothesis:

Hypothesis 1 Factors that are important for the financial and militarily feasibility of rebellion but are unimportant for motivation decisively increase the risk of civil war.

The feasibility hypothesis leaves the motivation of the rebel group unspecified, its initial agenda being determined by the preferences of the social entrepreneur leading whichever organization is the first to occupy the niche. Sometimes this will be a not-for-profit organization with a political or religious agenda, and sometimes a for-profit organization. Where the niche is sufficiently large several rebel groups

[1] The survey in the *Handbook of Defense Economics* provides a fuller discussion of this new literature (Collier and Hoeffler, 2007).

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may coexist, but the factors that explain the initial rebel agendas are incidental to the explanation of civil war. Weinstein (2005) provides an interesting extension: rather than motivation being orthogonal to the feasibility of civil war it may be determined by it. He shows that regardless of the initial agenda, where there is manifest scope for loot-seeking self-selection of recruits will gradually transform the rebel organization into one motivated by loot-seeking.

The two most obvious material conditions for rebellion are financial and military. A rebel army is hugely more expensive than a political party and faces far more acute organizational difficulties of raising voluntary contributions from within the country. For example, the Tamil Tigers, a relatively small rebel group in the small developing country of Sri Lanka, is estimated to spend between $200m and $350m per year, an amount equal to between 20% and 34% of the GDP of Northeast Sri Lanka, the zone it controls and for which it seeks political secession (see Strategic Foresight Group, 2006). In Britain, the leading opposition political party, unusually well-funded because it is pro-business, spends around $50m per year (see Conservative Party of Great-Britain, 2005), or about 0.002% of GDP. The Tamil Tigers are far short of being the best-funded rebel group in the world: their scale of funding is probably fairly normal for a rebel group, and the Conservative Party is far from being at the impecunious end of the distribution of opposition political parties. Yet the Tamil Tigers are commanding resources at least 10,000 times greater as a share of GDP than one of the world's major political opposition parties. More generally, a rebellion cannot be regarded as a natural evolution from, or alternative to, political protest: it requires a quantum difference in financial resources. Often a rebellion will simply be beyond the financial means of those groups politically opposed to the government. Similarly, in most states rebellion is not militarily feasible: the government has effective localized control of its entire territory. Financial and military viability are evidently interdependent: conditional upon the efficacy of government security there is some minimum military scale of rebellion which is capable of survival, and this determines the height of the financial hurdle that must be surmounted by an organization that aspires to rebellion. Viability is likely to be assisted by some combination of a geography that provides safe havens and an ineffective state.

This account can be contrasted with the more traditional grievance-based explanation which proposes that objective social exclusion explains civil war. However, the grievance-based account is itself only a subset of accounts based on motivation. While for purposes of propaganda rebel leaders are indeed likely to explain their motivation in terms of grievances, other plausible motivations for organized private violence would include predation and sadism. Indeed, since the typical civil war lasts for many years and rebel victories are rare, if rebellion is rational motivations are likely to reflect benefits during conflict, rather than prospective benefits consequent upon a victory which must be heavily discounted both by time and risk. Further, if the rebellion is rationally motivated it is more likely to be due to benefits that accrue to the rebel leadership itself, rather than to the attainment of social justice for a wider group: social justice is a public good and so faces acute collective action problems. Even if these collective action problems

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could be overcome, during civil war civilian suffering is very widespread so that the social groups that rebel leaders claim to be fighting for are likely to lose heavily: rebellion is far more likely to deliver devastation than justice. This opens a further motive-based account of civil war: rebellions may be due to mistakes, or they may even be non-rational. The former possibility has been developed in theories analogous to the winner's curse of auction theory: rebellions occur due to military over-optimism. The latter has not been explored formally, but there is evidence that several rebel leaders have shown signs of irrationality. Based on the examples of Bosnia and Rwanda, Mueller (2004) suggests that leaders whip up hatred and recruit 'fanatics, criminals and hooligans' to commit most of the violence. A further likely example of irrationality is the Ugandan Lord's Resistance Army whose leader claims to fight for the rights of the Acholi ethnic group in Northern Uganda. This rebel organization has killed and kidnapped many members of its own ethnic group. With its only stated goal being the establishment of rule by the Ten Commandments, it may be more closely analogous to freak religious groups such as Waco and Jonestown than to organizations of political opposition.

An implication of the wide range of possible explanations for rebellion is that the factors which potentially cause it cannot be restricted *a priori* to a narrow range of proxies for grievance. Our approach is rather to find proxies for each of the three major perspectives: feasibility, and the two main variants of motivation, greed and grievance. In practice, due to the limitations of data that are available globally for several decades, some concepts can only be proxied by variables that have more than one possible interpretation. This was, unfortunately, the case with our previous results. In the present analysis we introduce three new variables that have less ambiguous interpretations and so enable us to distinguish more readily between feasibility and motivation.

3. Data and method

We examine how likely it is for a country to experience an outbreak of civil war. War starts are coded as a binary variable and we analyse this risk by using logit regressions. The risk of a war start is examined in five-year periods, from 1965–69 until 2000–4. If a war breaks out during the five-year period we code this as a one and zero if the country remained peaceful. We code ongoing war observations as missing because we do not want to conflate the analysis of war initiation with the analysis of its duration. Previous research indicates that the duration of a civil war is determined by different factors from their onset (Collier *et al.*, 2004). In order to code civil war starts we used data provided by Kristian Gleditsch (2004), who has carefully updated the correlates of war (COW) project (Small and Singer, 1982, and Singer and Small, 1994).[2] An advantage of using this data set is that it is an update

[2] Gleditsch (2004) only lists wars until 2002. For the years 2003 and 2004 we used the Armed Conflict Dataset (ACD) by Gleditsch *et al.* (2002).

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of the data used in our previous work (Collier and Hoeffler, 2004) which makes comparisons between the previous and new results relatively straightforward. We perform robustness checks on an alternative new data set. Our analysis potentially includes 208 countries and 84 civil war outbreaks. We list these wars in Table 1.

The COW definition of civil wars is based on four main characteristics. It requires that there is organized military action and that at least 1,000 battle deaths resulted in a given year.[3] In order to distinguish wars from genocides, massacres, and pogroms there has to be effective resistance; at least 5% of the deaths have been inflicted by the weaker party. A further requirement is that the national government at the time was actively involved. Our alternative measure of civil war, which we use for robustness checks, is based on the 'Armed Conflict Dataset' (ACD) by Nils Petter Gleditsch *et al.* (2002). Their definition has two main dimensions. First, they distinguish four types of violent conflicts according to the participants and location: (1) extra-systemic conflicts (essentially colonial or imperialist wars), (2) interstate wars, (3) intrastate wars, and (4) internationalized intrastate wars. The second dimension defines the level of violence. *Minor* conflicts produce more than 25 battle related deaths per year, intermediate conflicts produce more than 25 battle related deaths per year and a total conflict history of more than 1,000 battle related deaths and lastly wars are conflicts which result in more than 1,000 battle related deaths per year. We coded civil wars as all armed conflicts except interstate wars, dating the war start for the first year when the violence level was coded as *war*, and the end as the first year when the armed conflict did not generate any deaths.

There are a large number of factors that may determine what makes a country more prone to a civil war. While we do not consider idiosyncratic characteristics for individual countries, such as trigger events and leadership, we have collected a wide variety of economic, political, sociological, geographic, and historical variables for our global cross-country panel. We present the summary statistics in Table 2 and list the data sources in the Appendix.

We start with a comprehensive model of factors that potentially influence the risk of rebellion. The theoretical and empirical justifications for considering these factors are discussed below. We then delete stepwise the variables that are not significant to end up with our core model described in Table 3, column 4. We have tested different ways of excluding variables to avoid issues of path dependency. The following key variables are included in the initial model. In what follows we briefly present the variables and their expected sign. A more extensive discussion of all variables will follow in the results section.

[3] However, the COW researchers made adjustments for long conflicts. For some major armed conflicts the number of battle deaths dropped below the 1,000 threshold but since the country was not at 'peace' the war is coded as ongoing. Without these adjustments many war countries would have multiple conflict spells rather than one long conflict.

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Table 1 List of civil wars

Country	War	Country	War	Country	War	Country	War
Afghanistan	1978–2001	DRC	1960–1965	Liberia*	1989–1990	Serbia*	1991–1992
Algeria	1962–1963	DRC*	1993	Liberia*	1992–1995	Serbia	1998–1999
Algeria*	1992–2000	DRC*	1996–2000	Liberia*	1996	Sierra Leone*	1991–1996
Angola*	1975–1991	CongoRep.*	1997–1999	Liberia	2003	Sierra Leone*	1998–2000
Angola*	1992–1994	Côte d'Ivoire*	2002-ongoing	Mozambique*	1979–1992	Somalia*	1982–1997
Angola*	1998–2001	Dom. Rep.*	1965	Myanmar*	1968–1980	South Africa*	1989–1993
Azerbaijan	1991–1994	El Salvador*	1979–1992	Myanmar*	1983–1995	South Africa*	1999–2002
Burundi*	1972	Ethiopia*	1974–1991	Nepal	2002-ongoing	Sri Lanka*	1971
Burundi*	1988	Guatemala*	1966–1972	Nicaragua*	1978–1979	Sri Lanka*	1983–1993
Burundi*	1991–1992	Guatemala*	1978–1984	Nicaragua*	1982–1990	Sri Lanka*	1995–2001
Burundi	1993–1998	Guinea-Biss.*	1998	Nigeria*	1967–1970	Sudan	1963–1972
Burundi	2000–2002	India*	1985–1993	Nigeria*	1980–1981	Sudan*	1983–1992
Cambodia	1970–1975	India*	2002-ongoing	Nigeria	1984	Sudan*	1995-ongoing
Cambodia	1978–1991	Indonesia	1956–1960	Pakistan*	1971	Thailand*	1970–1973
Cambodia	1993–1997	Iran*	1978–1979	Pakistan	1973–1977	Turkey*	1991–2002
Cameroon	1959–1961	Iran*	1981–1982	Pakistan*	1994–1995	Uganda	1966
Chad*	1966–1971	Iraq	1961–1963	Peru*	1982–1995	Uganda*	1980–1988
Chad	1980–1988	Iraq*	1974–1975	Philippines*	1972–1992	Uganda*	1996–2001
Chad*	1990	Iraq*	1985–1993	Philippines*	2000–2001	Uganda*	2004-ongoing
Chile*	1973	Iraq	1996	Romania*	1989	Vietnam	1960–1965
China*	1967–1968	Jordan*	1970	Russia*	1994–1996	Yemen	1962–1969
Colombia*	1984–1993	Lao PDR	1960–1962	Russia*	1998-ongoing	Yemen	1986
Colombia*	1998-ongoing	Lao PDR	1963–1973	Rwanda	1963–1964	Yemen	1994
		Lebanon	1975–1990	Rwanda*	1990–1993	Zimbabwe*	1972–1979
			Rwanda 1994				
			Rwanda* 1998				

Note: Source Gleditsch (2004), war observations marked with an asterisk are included in our core model (Table 3, column 4). If two wars broke out in the same five-year period we only coded one war start.

In our initial model we include the following economic variables:

Ln GDP per capita This is a difficult variable to interpret since it is correlated with many omitted variables. There is also a potential problem of reverse causality since a high risk of rebellion will depress income. With these caveats there are two reasons to expect that low *per capita* income would directly increase the risk of rebellion: the opportunity cost of rebellion is lower, and the state is likely to have less control over its territory.

Growth of GDP per capita This again raises serious problems of endogeneity. However, the expectation is that the faster the rate of growth the lower the risk of rebellion. For example, the faster is growth the tighter will be the labour market and so the more difficult will it be for the rebel organization to recruit.

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Table 2 Means of key variables

	Sample	Peaceful observations	Warstart observations	Former French African colonies
War start (dummy)	0.067	0	1	0.037
GDP *per capita* (US $, base year 1997)	5452	5764	1101	681
GDP *per capita* growth (t-1)	1.844	2.011	−0.486	0.204
Primary commodity exports (proportion of GDP)	0.164	0.165	0.146	0.178
Years of peace	32	33	16	32
Former French African colony (dummy)	0.101	0.104	0.056	1
Social fractionalization (index 0–1) 87	0.180	0.173	0.282	0.2
Proportion of young men (proportion of age 15–29 in total population)	0.129	0.129	0.133	0.1
Total population	30.2	28.3	56.5	9.1
Mountainous (proportion of total land area)	15.779	15.442	20.484	4.538
Number of observations	1063	992	71	107

Note: Based on the sample used for our core model, Table 3, column 4.

Miguel *et al.* (2004) were able to address endogeneity through instrumenting growth with rainfall shocks and found that it indeed substantially reduced risks.

Primary commodity exports (PCE) Natural resources can increase the risk of rebellion because they constitute easy sources of rebel finance. This may both directly motivate rebellion and make rebellions that are motivated by other considerations more feasible. They can also sever the government from the need to tax citizens and hence indirectly produce a government that is not accountable, thereby increasing the grounds for grievance. The previous empirical evidence on natural resources is ambiguous. In our earlier work (Collier and Hoeffler, 2004) we found that the relationship between natural resources and conflict takes the form of an inverted U-shape. We suggested that this arose because if the government had very large resource revenues it could afford to buy off all of its opponents so that beyond some point additional revenue was risk-reducing. Fearon (2005) agrees that resource revenues increase the risk of rebellion but argues that the relationship is log-linear rather than quadratic. Other studies, such as Fearon and Laitin (2003) emphasize the effect of oil rather than of natural resources in general. We use the quadratic formulation for our initial model, but check the robustness of our results with respect to points raised by other studies.

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Table 3 Feasibility of civil war

	(1)	(2)	(3)	(4)
Economy				
ln GDP *per capita*	−0.232	−0.233	−0.216	−0.216
	(1.72)*	(1.72)*	(1.74)*	(1.74)*
GDP *per capita*	−0.148	−0.147	−0.147	−0.144
Growth (*t*-1)	(3.69)***	(3.69)***	(3.69)***	(3.69)***
Primary commodity	7.150	6.98	6.916	6.988
Exports (PCE)	(1.74)*	(1.76)*	(1.76)*	(1.77)*
PCE squared	−14.581	−14.245	−14.233	−14.438
	(1.77)*	(1.79)*	(1.80)*	(1.82)*
History				
Post cold war	−0.135	−0.158	−0.138	
	(0.35)	(0.45)	(0.40)	
Previous war	−0.082			
	(0.17)			
Peace	−0.058	−0.056	−0.056	−0.056
	(3.78)***	(5.75)***	(5.77)***	(5.83)***
Former French	−1.203	−1.201	−1.231	−1.221
African Colony	(1.95)*	(1.94)*	(2.02)**	(2.00)**
Social Characteristics				
Social	2.173	2.189	2.193	2.186
Fractionalization	(2.68)***	(2.72)***	(2.72)***	(2.71)***
Proportion of young men	12.493	12.378	12.532	12.639
	(1.52)	(1.51)	(1.54)	(1.55) p = 0.12
Ln population	0.276	0.272	0.272	0.266
	(2.72)***	(2.76)***	(2.76)***	(2.73)***
Geography				
Mountainous	0.011	0.011	0.011	0.011
	(1.48)	(1.48)	(1.46)	(1.45)
Polity				
Democracy	0.012	0.014		
	(0.27)	(0.30)		
Observations	1063	1063	1063	1063
Pseudo R^2	0.28	0.28	0.28	0.28
Log likelihood	−188.66	−188.68	−188.72	−188.80

Note: Logit regressions, dependent variable: war start. Absolute value of z statistics in parentheses. Asterisks (*, **, ***) indicate significance at the 10%, 5%, and 1% level, respectively. All regressions include an intercept (not reported).

Country studies of civil war invariably trace the onset of rebellion to some historical roots and so historical conditions should be expected to matter for the risk of conflict. We investigate the following:

Post cold war The impact of this variable on the conflict risk is controversial. While Kaplan (1994) predicted that the fall of the iron curtain would increase the number of conflicts, Gleditsch *et al.* (2002) argue the contrary. Thus, *a priori* the sign of this variable is ambiguous.

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Previous war We analyse the effect of previous civil war through two variables which need to be considered jointly: a dummy variable for the occurrence of a previous civil war and a continuous variable which measures the number of months since the previous war ended (peace). The dummy variable controls for any fixed effects that might have precipitated the initial war and also make the country prone to further wars. Having controlled for such effects, the continuous variable measuring the time since the previous war, proxies legacy effects which might be expected gradually to fade. These might be psychological, such as hatreds or a sense of 'never again', material, such as stocks of weapons, and organizational, notably the rebel army. In principle the sign is ambiguous.

Former French African colony A security guarantee from an outside regime for the government in power can reduce the incentives for rebellion. The only nation that provided a de facto security guarantee to some of its former colonies was France between 1965 and 1999. We shall accordingly expect this dummy variable to reduce the scope for conflict.

The composition of the society is also commonly invoked as an explanation for conflict. We therefore include:

Social fractionalization The impact of ethnic and religious social cleavages on the risk of conflict has been controversial in the literature (Collier and Hoeffler, 1998, 2004; Fearon and Laitin, 2003). Different forms of fractionalization have previously been found to increase, reduce, or not affect the scope for conflict. Therefore, we do not *a priori* expect a particular sign for this variable. In the main analysis we include a variable of social fractionalization that captures various forms of cleavages. The exact definition of this variable is discussed in more detail further below.

Proportion of young men We expect this variable to increase the risk of rebellion. A great availability of potential recruits as rebel soldiers makes is easier and cheaper to start a rebellion. It may also increase the alienation of youth.

Ln population Since our economic scale variable is *per capita* income, our remaining scale variable is population size. The key interest in this variable is not its sign, which is likely to be positive, but whether the marginal effects are large. If an increase in the population does not proportionately raise the risk of conflict this could be interpreted as evidence of scale economies in security. If, for example, two identical countries are merged with no underlying change in the risk in either place, r, then the measured risk of rebellion (in either location) would be $r+(1-r)r$ and so would very nearly double. Thus, if the coefficient on population was such that risks increased proportionately this would in effect be the benchmark of size neutrality.

Geography This is particularly pertinent for investigating the feasibility hypothesis. In Collier and Hoeffler (2004) we investigated both forest cover and the extent of mountainous terrain. The former was insignificant and is not investigated further here. The latter was marginally significant and was subsequently incorporated

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by Fearon and Laitin (2003) who extended the measure. We use that extended measure here.

The majority of the academic work on civil war is conducted by political scientists. This reflects a presumption that it is at root driven by the grievance of political exclusion. We therefore include a measure of the extent of political rights.

4. Results

4.1 Overview and descriptive statistics

Wars tend to occur in situations where data collection has already broken down and so there is a severe trade-off between the number of wars that can be included and the quality of the data on which the analysis is based. Our core regression includes 71 of the 84 wars and has 1063 observations for 172 countries. This sample is a considerable improvement on the core regression used in Collier and Hoeffler (2004) which was based on 52 wars and 688 observations. Our core sample includes some imputed data for social fractionalization, young men, and mountains. For variables with missing data points we have set missing values to the mean of observed values and added a dummy variable which takes the value of unity if the data are missing.[4] This tests whether the assumption that missing observations are on average the same as actual observations is correct. When this dummy[5] variable is insignificant, so that the assumption is accepted, the dummy is then dropped from the regression. Potentially data imputation can be taken further than this and in one of our robustness checks we use the AMELIA method of multiple random imputation of all missing values of explanatory variables. This enables us to include all 84 wars and 1472 observations.

As mentioned earlier, Table 1 gives an overview list of all civil wars included in the data set and Table 2 presents descriptive statistics of the key variables of the core model. We now turn to the regression analysis.

4.2 Core results

Our core results are developed in Table 3. In the first three columns we progressively eliminate insignificant variables stepwise to arrive at the core model of column 4.[6] We now discuss in detail the results for the variables included in the core model.

The key theme of our previous analysis was that three economic characteristics drive proneness to civil war, namely the level, growth, and structure of income.

[4] On this treatment of missing values see Greene (2003, p.59–60).

[5] 'Dummy' refers to a dichotomous variable that can only take the values of zero or one.

[6] This method of stepwise deletion is based on the 'general to specific' approach (Hendry, 1995, p.270). More recently this method has also been used in a cross-section context (Hendry and Krolzig, 2004).

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Peaceful observations in our data set are characterized by a *per capita* income that is more than five times higher than in countries in which wars broke out. To reduce problems of endogeneity we measure income at the start of each five-year period. In all columns of Table 3 we find that the risk of a civil war during the period is significantly greater at lower levels of initial income. It is useful to benchmark the risk of conflict in a hypothetical country with characteristics set at the sample mean. The predicted risk for such a country is 4.6%.[7] If the level of *per capita* income is halved from this level, the risk is increased to 5.3%. The effect of the level of income is also found by the other major global quantitative study, Fearon and Laitin (2003). However, even with a five-year lag there are potentially serious concerns about endogeneity. When we turn to our robustness checks we address these issues, showing that our initial results survive once income is instrumented.

Although income appears to be proxying some causal relationship, its interpretation is extremely difficult since it is correlated with so many other features of a society. Fearon and Laitin (2003) interpret it as proxying the effectiveness of the state, and thus the ability of the government to deter rebellion. In our previous work we interpreted it as proxying the opportunity cost of time and hence the cost of rebel recruitment. These interpretations need not be alternatives.

Wars often start following growth collapses. To reduce problems of endogeneity we measure the growth rate of GDP *per capita* over the five-year period prior to that for which we are estimating the risk of conflict. The growth rate during the five years prior to conflict averages -0.5%, compared to 2% in peaceful countries. In all the columns of Table 3 growth significantly reduces the risk of conflict. Again at the mean of other characteristics, if the growth rate is increased by one percentage point, the risk of conflict decreases by 0.6 percentage points to 4.0%. The effect of the growth rate of income is also found by Miguel *et al.* (2004) using Africa-only data, on which they are able ingeniously to instrument for growth by means of rainfall. This is not a feasible option for a global sample since Africa is atypical in having rain-fed agriculture as a large component of GDP. Again, growth can be interpreted in several different ways. Our own interpretation stays with the issue of rebel recruitment: growth implies job creation which reduces the pool of labour likely to be targeted by rebels. However, growth could also be an important determinant of government popularity and through this influence the willingness of the population to support rebels, or at least not inform against them.

Our final economic variable is the structure of income. We follow Sachs and Warner (2000) and proxy richness in natural resources by the proportion of primary commodity exports in GDP, measuring it at the start of each period. In all columns of Table 3 there is an inverted U-shaped relationship between natural resources and conflict, with the sign of primary commodity exports (PCE) being positive and significant and PCE squared being negative and significant. Since Fearon (2005) has argued that the relationship is log-linear rather than quadratic,

[7] For readability, the marginal effects are not displayed in the tables.

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we tested the log-linear specification against the quadratic, but found that the latter dominates: the risk of dependence upon primary commodity exports is at its peak when exports constitute around 25% of GDP. Taking the extremes of 0% and 25%, the implied risks at the mean of other characteristics are 2.2% and 5.0%.

The channels by which primary commodities might relate to the risk of conflict have come under intense scrutiny and debate (Ross, 2004; Humphreys, 2005; Rohner, 2006). Three channels seem likely. One is that primary commodity exports provide opportunities for rebel predation during conflict and so can finance the escalation and sustainability of rebellion. The most celebrated cases are the diamond-financed rebellions in Sierra Leone and Angola. Oil also provides ample opportunities for rebel finance, whether through 'bunkering' (tapping of pipelines and theft of oil), kidnapping and ransoming of oil workers, or extortion rackets against oil companies (often disguised as 'community support'). A second channel is that rebellions may actually be motivated, as opposed to merely being made feasible, by the desire to capture the rents, either during or after conflict. A third channel is that the governments of resource-rich countries tend to be more remote from their populations since they do not need to tax them, so that grievances are stronger (see Tilly, 1975). Evidently, these three channels need not be alternatives, but a study by Lujala *et al.* (2005) helps to distinguish between them. They find that conflicts are more likely to be located in the areas of a country in which natural resources are extracted, providing some support for the rebel finance hypothesis.

Two policy implications have often been drawn from our previous results on these three economic variables. One is that economic development is critical for reducing the incidence of civil war. The other is that international trade in primary commodities carries particular risks and so warrants special measures such as the Kimberley Process and the Extractive Industries Transparency Initiative. As is evident from our above discussion, while these policies are consistent with our results they are not entailed by them: alternative interpretations could be found in which these would not be warranted. However, our present results remain consistent with these policies.

Twenty-three countries experienced repeat civil wars. Either this reflects country fixed-effects, or conflict increases the risk of further conflict. To test the latter we introduced a variable for the time that has passed since the previous conflict.[8] This is again highly significant: in all the columns of Table 3 risks decline as the duration of peace lengthens but the effect is very slow. A country only ten years post-conflict has a risk of 14.2%, and one that is 20 years post-conflict has a risk of 8.6%. To check that this is not proxying some unobserved fixed characteristic that makes these countries endemically prone to conflict we introduced a dummy variable that took the value of unity if the country had had a previous conflict (Table 3, column 1). The variable is insignificant. The high risk of repeat conflict was one component

[8] If the country never experienced a civil war we count the years since the end of World War II.

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of our concept of the 'conflict trap'. Once a country stumbled into a civil war there was a danger that it would enter a dysfunctional cycle in which the legacy of war was a heightened risk of further conflict, partly because of this time effect, and partly because of the likely decline in income. The principle legacy of a civil war is a grossly heightened risk of further civil war.

We now turn to the effect of population size. In all columns of Table 3 population size increases the risk of civil war. However, the marginal effect is small. A doubling of population size increases the risk of civil war by only one fifth (from 4.6% to 5.5%). The most plausible interpretation of this is that there are economies of scale in certain basic functions of the state, most notably the deterrence of organized violence.[9] An implication is that controlling for other characteristics, a region that is divided into many countries, such as Africa, will have considerably more conflicts that one which is divided into only a few countries, such as South Asia. This result sits uneasily with the recent international fashion for settling conflicts by the creation of new states: Eritrea and prospectively Southern Sudan in Africa, the dissolution of Yugoslavia in Europe, East Timor in Asia, the (now-dissolved) FARC mini-state in Latin America, and most recently the two Palestinian proto-states of the West Bank and Gaza in the Middle East. As the low-income world divides into more countries to settle 'historic grievances' there should be some presumption that unless these societies achieve economic development internal conflict is likely eventually to increase.

These five variables (income, growth, natural resources, peace duration, and population) constitute what is common between our previous analysis and our present results. What is different? One difference is in respect of social composition. In our previous work we found that ethnic fractionalization had ambiguous effects. Risks were increased by what we termed 'ethnic dominance'. By this we meant that the largest ethnic group constituted somewhere between 45% and 90% of the population. Other than this, we found that social and religious fractionalization tended to reduce the risk of conflict. In combination this implied a quadratic effect of ethnic fractionalization, first increasing risk and then reducing it. With our new data we find a simpler relationship: social fractionalization significantly increases risk (cf. all columns of Table 3). We measure social fractionalization by combining two measures of ethnic and religious diversity. The ethno-linguistic fractionalization index measures the probability of two randomly picked individuals not speaking the same language. The religious fractionalization index is constructed in a similar way. We use a combination of these two variables to capture the possible cross cutting of ethnic and religious diversity. *A priori*, ethnic and religious fractionalization can interact in various ways. If cleavages are coincident either one might be redundant. If cleavages are non-coincident they could be additive, with three ethnic groups and three religious groups generating six differentiated groups,

[9] In support of this, Collier *et al.* (2008) find that the effectiveness of international peacekeeping forces is related to their absolute size and not their size relative to population or economic activity.

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or multiplicative, with cross-cutting cleavages generating nine groups. We found that the multiplicative specification dominated other possibilities and this is the specification adopted in our core regressions.[10] So measured, doubling social fractionalization from 18% to 36%, for example, raises the risk of conflict from 4.6 to 6.67%. The change of results from our previous analysis matters most for risk estimates in the most ethnically diverse societies, most notably much of Africa.

Three new variables enter the core regression, surviving the stepwise deletion process in Table 3. The first is a dummy for being a former French colony in Africa during the period 1965–99. This has a negative sign and is significant, as shown in Table 3, column 4. During this period analysed the former French colonies of Africa had a risk of civil war that was less than a third of that which would otherwise have been predicted. They faced a risk of 2.6% (given the estimated coefficient), while they would have suffered a civil war risk of 8.2% if they had had the same characteristics, but without being Francophone. How might this have come about? One possibility is that the distinctive cultural and administrative traditions established by France have left a more peaceable legacy than those societies that were not colonized by France. An alternative interpretation is that during this period Francophone Africa remained under a French military umbrella, with French bases through the region providing *de facto* security guarantees. Since the security guarantees were confined to sub-Saharan Africa, partly for logistical reasons, and to a clearly defined period, it is possible to test between these two interpretations by including both a dummy variable for all countries that were former French colonies, a dummy variable for the Francophone sub-Saharan African countries during 1965–99, and a dummy variable for sub-Saharan Africa. As discussed in more detail in our discussion of robustness tests, we show that it is the security interpretation which is best-supported. The French policy was in striking contrast to British post-colonial policy which very rapidly ceased to countenance military intervention. As political governance gradually became more of an issue during the 1990s, French military intervention came to be seen as unjustified since it had involved support for tainted regimes (Michailof, 1993, 2005). The decisive departure from the practice of guarantees was when the French government decided to allow the coup d'etat in Cote d'Ivoire of December 1998 to stand despite being in a position to reverse it. This was a controversial decision taking by a new President against the advice of the civil service establishment whose views reflected past practice. This decision enables the shift in policy to be precisely dated.

Paradoxically, shortly after the French government decided against further military intervention the British government introduced it, sending a substantial force

[10] Potentially, this implies that if a society is homogenous with respect to either religion or ethnicity then the other dimension of differentiation has no effect. In practice, the only society so characterized in our data is Mauritania.

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into Sierra Leone to end the civil war and enforce the post-conflict peace. This British policy is evidently too recent and indeed to date too country-specific to warrant inclusion in a statistical analysis. However, we invite political scientists to construct a variable which rates for each country-year globally over this period the *de facto* security guarantees provided, whether from former colonists, superpowers, or military alliances. The introduction of such a variable into the analysis would provide a useful test of a widespread strategy.

A second new variable that we include in our core model is the proportion of the population made up of males in the age range 15–29. In our previous work this was insignificant but the expansion of sample and improvement in data quality bring it sufficiently close to significance to warrant inclusion (see Table 3, column 4). Our robustness checks, discussed below, also support the inclusion of this variable. A doubling in the proportion of the population in this category increases the risk of conflict from 4.6 to 19.7%. As with criminality, rebellion relies almost exclusively upon this particular segment of the population. A likely explanation for this extreme selectivity is that some young men have both an absolute advantage and a taste for violence. Some rebel groups undertake forced recruitment from among boys. A common tactic, employed for example by the Lord's Resistance Army in Uganda, was for boys to be kidnapped from schools and then required to commit an atrocity that made it impossible for them to return to their community. Another tactic, employed for example by the Revolutionary United Forces in Sierra Leone, is to target young male drug addicts who can then be controlled through drug supplies.

A third new variable is the proportion of the terrain of a country that is mountainous This is a difficult concept to measure empirically because it is not well-proxied by crude objective indicators such as altitude: a high plateau is not particularly 'mountainous'. For the measure used in our previous work we commissioned a specialist geographer, John Gerrard, to code terrain globally (Gerrard, 2000). This has since been extended by Fearon and Laitin (2003), who indeed found the variable to be significant in their specification, and we use these extended data. In our core specification the variable is not quite significant ($p = 0.14$) but we retain it, in part because of its intrinsic plausibility. We also find the point estimate and standard error for mountainous to be very stable when we subject this core model to the various specification and robustness checks discussed below. The effect is potentially large. Taking the point estimate at face value, were Nepal flat its risk of civil war would have been 3.5% based on its other characteristics. Given that 67.4% of its terrain is mountainous, its risk was 7%. This variable replaces our previous geographic variable, which measured the dispersion of the population over the country, which is no longer significant.

In addition to the variables listed in Table 3 we also tested the significance of a number of other possible determinants of war risk. None of the measures of inequality were significant, nor were literacy rates for men, political rights, checks and balances, and the proportion of the country covered by forests.

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Table 4 Specification tests

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Economy							
ln GDP	−0.155	−0.149	−0.256	−0.211	−0.210	−0.219	−0.212
per capita	(1.09)	(1.05)	(1.83)*	(1.70)*	(1.67)*	(1.75)*	(1.70)*
GDP *per capita*	−0.142	−0.143	−0.141	−0.142	−0.143	−0.142	−0.144
Growth (t-1)	(3.61)***	(3.63)***	(3.57)***	(3.66)***	(3.68)***	(3.64)***	(3.69)***
PCE	7.167	7.011	6.444	7.578	6.842	6.622	7.339
	(1.80)*	(1.78)*	(1.63)	(1.89)*	(1.73)*	(1.63)	(1.80)*
PCE squared	−14.536	−14.220	−13.584	−15.328	−14.239	−13.835	−14.766
	(1.82)*	(1.80)*	(1.72)*	(1.92)*	(1.80)*	(1.72)*	(1.85)*
Fuel exports							−0.002
							(0.35)
History							
Peace	−0.056	−0.056	−0.054	−0.056	−0.056	−0.055	−0.056
	(5.82)***	(5.83)***	(5.65)***	(5.84)***	(5.83)***	(5.81)***	(5.82)***
Former French	−1.071	−1.340	−1.265	−1.144	−1.238	−1.254	−1.227
African colony	(1.08)	(2.17)**	(2.06)**	(1.87)*	(2.03)**	(2.03)**	(2.01)**
Former French	−0.268						
colony	(0.34)						
Years since			0.002				
independence			(0.63)				
Social Character							
Social	1.597	1.650	2.330	2.941	1.788	2.159	2.155
Fractionalization	(1.63)	(1.70)*	(2.76)***	(2.41)**	(1.50)	(2.66)***	(2.66)***
Ethnic					0.372		
Fractionalization					(0.45)		
Ethnic				−0.471			
Dominance				(0.82)			
Proportion of	12.896	13.021	13.138	13.450	12.650	12.984	12.721
young men	(1.60)	(1.62)	(1.61)	(1.63)	(1.54)	(1.58)	(1.55)
ln population	0.302	0.304	0.213	0.268	0.256	0.263	0.271
	(2.83)***	(2.84)***	(1.95)*	(2.76)***	(2.57)**	(2.70)***	(2.73)***
Geography							
Mountainous	0.011	0.012	0.009	0.011	0.011	0.010	0.011
	(1.52)	(1.56)	(1.14)	(1.46)	(1.45)	(1.38)	(1.47)
Sub Saharan	0.445	0.463					
Africa	(0.95)	(0.99)					
Population						−0.000	
density						(0.32)	
Observations	1063	1063	996	1063	1063	1063	1063
Pseudo R^2	0.28	0.28	0.27	0.28	0.28	0.28	0.28
Log likelihood	−188.25	−188.31	−187.95	−188.47	−188.70	−188.72	−188.74

Note: Logit regressions, dependent variable: war start. Absolute value of z statistics in parentheses. Asterisks (*, **, ***) indicate significance at the 10%, 5%, and 1% level, respectively. All regressions include an intercept (not reported).

4.3 Robustness checks

How robust are these results? Our procedure of stepwise deletion risks path-dependence and some of the variables are likely to be endogenous. Table 4 presents specification tests while Table 5 extends the analysis to a wider class of robustness checks.

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Table 5a Further robustness checks

	(1) First war only	(2) Linear probability model	(3) 2SLS	(4) ACD data set	(5) Fixed effects	(6) Random effects
Economy						
ln GDP *per capita*	−0.311	−0.011	−0.025	−0.117	−0.635	−0.221
	(2.06)**	(1.90)*	(2.12)**	(0.79)	(1.39)	(1.75)*
GDP *per capita*	−0.075	−0.011	−0.010	−0.157	−0.220	−0.144
Growth (*t*-1)	(1.41)	(4.55)***	(4.28)***	(3.40)***	(3.55)***	(3.67)***
PCE	5.263	0.156	0.097	4.386	8.087	7.104
	(1.16)	(0.87)	(0.54)	(0.95)	(1.61)	(1.78)*
PCE squared	−10.157	−0.307	−0.207	−9.729	−13.154	−14.596
	(1.16)	(1.20)	(0.81)	(1.11)	(1.01)	(1.82)*
History						
Peace	−0.006	−0.004	0.004	−0.060	0.068	−0.058
	(0.47)	(6.14)***	(5.77)***	(5.01)***	(3.43)***	(5.68)***
Former French	−1.252	−0.086	−0.108	−1.191	−16.206	−1.235
African colony	(1.58)	(3.39)***	(3.31)***	(1.47)	(0.01)	(1.99)**
Social characteristics						
Social	1.621	0.186	0.153	1.907		2.203
Fractionalization	(1.56)	(3.07)***	(2.26)**	(1.96)**		(2.68)***
Proportion of	14.526	0.375	0.302	15.589	−37.337	12.463
young men	(1.63)*	(0.90)	(0.72)	(1.66)**	(1.56)	(1.51)
ln population	0.232	0.014	0.012	0.257	0.892	0.273
	(1.99)**	(2.59)**	(2.14)*	(2.07)**	(1.50)	(2.75)***
Geography						
Mountainous	0.013	0.003	0.0001	0.005		0.011
	(1.48)	(0.62)	(0.20)	(0.54)		(1.44)
Observations	1026	911	911	1045	242	1063
Pseudo R^2	0.11	0.15	0.21	0.25		
Log likelihood	−132.36			−134.43	−70.74	−188.89

Note: Logit regressions, dependent variable: war start. Absolute value of z statistics in parentheses. Asterisks (*, **, ***) indicate significance at the 10%, 5%, and 1% level, respectively. All regressions include an intercept (not reported).

We first test the robustness of the dummy variable for Francophone Africa during 1965–99. We add dummy variables for being a former French colony, regardless of region, and for being African regardless of colonial history. When all three variables are included (Table 4, column 1) none is significant, but the dummy variable for being a former French African colony has the highest *z*-statistics. Eliminating successively those of these three variables with the lowest z-statistics (see Table 4, column 2) leaves this as the only surviving, significant variable. Hence, the most reasonable interpretation is that the radically lower risk of conflict was as a result of the French security guarantee.

In column 3 we show that the number of years since independence does not significantly affect the risk of conflict. In the columns 4 and 5 we show that our measure of social fractionalization has a stronger impact than alternative measures of

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Table 5b Further robustness checks

	(7) Time effects	(8) Post full independence	(9) Rare events	(10) Amelia
Economy				
ln GDP *per capita*	−0.211	−0.237	−0.209	−0.255
	(1.69)*	(1.89)*	(2.05)*	(2.22)**
GDP *per capita*	−0.145	−0.126	−0.141	−0.083
Growth (t-1)	(3.40)***	(3.20)***	(4.29)***	(2.74)***
PCE	6.737	6.847	5.980	1.743
	(1.69)*	(1.71)*	(1.62)*	(0.858)
PCE squared	−13.96	−14.304	−11.854	−3.671*
	(1.74)*	(1.77)*	(1.63)*	(1.31)
History				
Peace	−0.058	−0.057	−0.053	−0.059
	(5.84)***	(5.90)***	(5.51)***	(6.50)***
Former French	−1.230	−1.259	−1.095	−0.873
African colony	(2.01)*	(2.05)**	(1.89)*	(1.517)*
Social characteristics				
Social	2.157	2.084	2.140	2.001
Fractionalization	(2.64)***	(2.55)***	(2.80)***	(2.81)***
Proportion of	12.676	13.659	13.274	18.59
young men	(1.53)	(1.66)*	(1.70)**	(3.15)***
ln population	0.262	0.225	0.254	0.316
	(2.61)***	(2.26)**	(3.14)***	(3.89)***
Geography				
Mountainous	0.011	0.010	0.010	0.006
	(1.47)	(1.40)	(1.46)	(1.20)
Time dummy	0.798			
1970–1974	(1.49)			
Time dummy	0.230			
1975–1979	(0.39)			
Time dummy	0.732			
1980–1984	(1.32)			
Time dummy	0.158			
1985–1989	(0.25)			
Time dummy	1.038			
1990–1994	(1.84)*			
Time dummy	0.452			
1995–1999	(0.78)			
Time dummy	0.260			
2000–2004	(0.40)			
Observations	1063	1020	1063	1472
Pseudo R^2	0.29	0.27	0.27	–0.31
Log likelihood	−185.82	−183.11	−222.6	−236.0

Note: Logit regressions, dependent variable: war start. Absolute value of *z* statistics in parentheses. Asterisks (*, **, ***) indicate significance at the 10%, 5%, and 1% level, respectively. All regressions include an intercept (not reported).

ethnic dominance and ethnic fractionalization. In column 6 we show that population density does not significantly affect the risk of conflict.

As mentioned, Fearon and Laitin (2003) have argued that what matters is not as much natural resources in general, but oil in particular. We therefore tested

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whether the relationship was more general than oil (Table 4, column 7). The addition of a variable for the value of fuel exports was insignificant, while the original specification of primary commodity exports and its square both remained significant.

In Table 5 we investigate a range of more methodological issues. In the first three columns of Table 5 we check the robustness of the income variable. Post-conflict countries will tend to have lower income than other countries, due to the costly effects of war, and they will also tend to have higher risks of conflict, if only because of unobserved fixed effects. This creates the possibility that the association between low income and high risk is not causal. To control for this possibility we investigate a variant in which only 'first time' civil wars are included, with post-conflict countries dropped from the sample (Table 5, column 1). The concept of 'first-time wars' is made much easier empirically because for several decades until the wave of decolonization around the start of the period covered in our analysis peace was maintained through imperial rule in much of the world. With subsequent wars excluded, income remains significant. In addition, we also used more formal, econometric tests to check whether the endogeneity of income is likely to cause problems with the interpretation of the results obtained from our core model. Since there are no standard endogeneity tests for logit or probit models, we re-estimate our core regression as a linear probability model, a strategy previously employed by Miguel *et al.* (2004), and instrument income. Our instruments for income are the distance from Washington DC, access to the nearest sea port, and the proportion of the country that is located in the tropics. We do not have the values for the instrumental variables for all countries and our sample size is significantly reduced from 1063 to 911 observations. In order to compare our two stage regression results we present the linear probability model estimated on this reduced sample size in Table 5, column 2. Compared with our core model primary commodity exports are not statistically significant. A Hausman test suggests that income may be endogenous[11] and we present our two stage least squares results in Table 5, column 3. The Hansen test suggests that our instruments are valid ($p = 0.58$). Instrumented income is significant at the 5% level and the coefficient point estimate is more than double than when income is uninstrumented. Further, all the other variables that were significant in the uninstrumented regression run on the restricted 911 observations remain significant when income is instrumented. To sum up, we find some evidence that income is endogenous but our instrumental variable results suggest that this is unlikely to mislead us in the interpretation of our results, since instrumented income has an even stronger impact on the risk of a civil war outbreak when compared with the non-instrumented model and no other variables lose significance.

[11] Following Wooldridge (2002) we first regress income on all of the variables included in the core model and our three instruments. We then predict the residuals from this regression and include them in the core model. The coefficient on the residual is not significant ($p = 0.12$). Thus, there is only weak evidence that income should be instrumented.

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In column 4 we change the definition of the dependent variable to the new Uppsala/PRIO Armed Conflict Dataset (ACD) by Gleditsch *et al.* (2002). For this regression we make a corresponding change in our measure of the time since the previous civil war, basing the estimate on the ACD. Our results are very similar; growth, peace, population, and fractionalization are significant, the proportion of young men in the society now becomes significant, while income and primary commodity exports lose significance but do not change sign. In column 5 we introduce fixed effects. This leads to a loss of observations; if countries had no time variation in the dependent variable, i.e. entirely peaceful countries, they are dropped from the sample. Time-invariant variables have to be omitted from this estimation. None of the variables that change slowly over time are significant but two time-variant variables, growth and peace, are significant. The sixth column introduces random effects. The core results all remain significant. The seventh column introduces time dummies. These have little effect on the core results and only one of them is individually significant: there was a temporary increase in the risk of civil war in the first half of the 1990s. This provides some evidence for Kaplan's 'coming anarchy' hypothesis which was published in 1994. Luckily, this turned out not to be a general post cold-war trend because the dummies for 1995–99 and 2000–04 are not statistically significant. In a further robustness check in column 8 we exclude countries if they were not fully independent at the start of the sub-period. We lose two wars (Angola and Mozambique's war starts in the 1975–79 period) and a further 41 peace observations. The results are now a little stronger than the ones obtained from our core model, all variables apart from mountains are now significant at conventional levels. In column 9 of Table 5 we make the standard adjustment for rare events (King and Zeng, 2001). This treatment strengthens our results. In column 10 we expand the sample to its maximum by using the AMELIA program of multiple imputation of all missing values of explanatory variables (King *et al.*, 2001). This increases our coverage of civil wars from 71 to the full 84. Again, this seems to strengthen our results. The proportion of young men in the society is now significant at the one % level. The level of primary commodity exports is no longer significant, but its square term remains significant at the 10% level. This weaker result is most likely due to the characteristics of the previously omitted conflicts. They tend to be in countries in which official data on exports radically underestimate actual transactions. For example, in Afghanistan and Cambodia, two of the omitted conflicts, there is considerable evidence that the conflict was financed partly by substantial illegal exports of drugs, gems, and timber. Hence, the loss of significance for primary commodity exports may well be the result of introducing severely biased data.

4.4 Implications

We now return to our core results and focus on the implications of the three new variables. The variables, countries under the French security umbrella, the proportion of young men in the population, and the proportion of the terrain which

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is mountainous, all have substantial effects. Consider two hypothetical countries whose characteristics were at the mean of all the other variables but which differed substantially in respect of these three. One was under the implicit French security umbrella, had only half the average proportion of young men in its society, and had no mountainous terrain. The other was not under the security umbrella, had double the average proportion of young men in its society, and was as mountainous as Nepal. The respective risks of civil war in these two otherwise identical societies are 0.6% and 32.9%.

However, the key significance of these new variables is not that they have such substantial effects but that they are somewhat easier to interpret than any of the variables that were previously found to be significant. They are better proxies for distinguishing between the two key branches of the theoretical models: motivation versus feasibility. While the three economic variables, the level, growth, and structure of income, can all be interpreted as either feasibility or motivation, the three new variables cannot so readily be interpreted as proxying motivation. By contrast, they all have very ready interpretations as important aspects of feasibility. The Francophone security guarantee made rebellion more dangerous and less likely to succeed. It was simply less militarily feasible. Mountainous terrain provides an obvious safe haven for rebel forces: it increases military feasibility. Finally, the proportion of young men in the society is a good proxy for the proportion of the population psychologically predisposed to violence and best-suited for rebel recruitment: again, it makes rebellion more feasible. The results are therefore consistent with the feasibility hypothesis.

However, they are still not a fully convincing test of the hypothesis because two of them can also be interpreted as affecting the motivation for rebellion. Mountainous areas might be atypically poor, and so proxy wide regional inequalities. There is a long history of cities of the plains being attacked by the marches. Similarly, in societies with a high proportion of young men youth might be the victim of exploitation by older age groups. We have not, however, been able to think of an equivalent motivation-based account for the effect of La Francophonie. If the most plausible interpretation of the importance of mountains and of the proportion of young men in the society is that they proxy important aspects of feasibility, then the results are powerful. By construction the two hypothetical countries are identical in respect of all other motivations for conflict, and differ only in these three aspects of feasibility. The implication would be that differences in feasibility are decisive for the risk of conflict.

Two other variables are perhaps also most readily interpreted as proxying feasibility, although they could be interpreted in other ways. These are population size and primary commodity exports. The fact that the marginal effect of the log of population size is relatively small reflects scale economies in security provision and so proxies military feasibility. Primary commodity exports probably proxy the scope for rebel financial predation and so proxy financial feasibility. We conclude with a refinement of our two hypothetical countries in which these two variables are added as further differences. In the former, in which rebellion

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is already difficult, we set the population to be 50 million, and set primary commodity exports as a share of GDP to zero. Note that all these five features that make rebellion less feasible are within the observed range. All the other characteristics of the country are at the sample mean. In the other territory, in which rebellion is easy, there are five identical countries each with a population of 10 million. Each has primary commodity exports equal to 25% of GDP and also the other three features that make rebellion easy, as specified previously. Other than these characteristics each is identical to the country in which rebellion is difficult. By design, each territory has the same total population although one is divided into five small countries, and the characteristics that might affect the motive for rebellion have been kept constant at the mean of all observations. What is the risk of civil war in each of these territories? In the territory in which rebellion is difficult the risk of civil war in any five-year period is now only 0.3%. In other words, rebellion does not occur because it is infeasible. In the territory in which there are fewer impediments to rebellion the risk that a civil war will erupt somewhere in the territory is now an astonishing 99.8%.[12] Thus, where rebellion is feasible, it will occur without any special inducements in terms of motivation. While our five variables have broadly captured the important aspects of feasibility, namely finance, military deterrence, and the availability of suitable recruits, we have not set up an extreme situation. For example, we have not introduced anything about the level or growth of *per capita* income, or about the time since a previous civil war. Low *per capita* income, slow growth, and the organizational and armaments legacies from a previous civil war all make rebellion more feasible even though they may also increase the motivation for rebellion.

Thus, the new evidence goes considerably beyond supporting the key results of our previous work about the primacy of economic variables in the risk of civil war. While not decisive, it points clearly towards the proposition that feasibility rather than motivation is decisive for the risk of rebellion.

There are, however, severe limits to what can be concluded from the regression analysis of global data sets. Our variables are proxies for concepts that could be much better measured by purpose-design field studies. Our analysis suggests the importance of causal processes about the conditions of viability for rebellion. Oyefusi (2007) provides detailed micro-evidence on rebel recruitment in the Niger delta. In this case study the decision to join seems to be determined by personal economic characteristics rather than by group grievances. However, what is needed are more complementary economic anthropology studies that provide the basis for quantitative micro-level analysis.

[12] In each small country separately it is 28.5.

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5. Conclusion

In this paper we have analysed empirically the causes of civil war. This is our third paper on the topic. Our first, (Collier and Hoeffler, 1998) was the first quantitative study of the topic. Our second, (Collier and Hoeffler, 2004) though a major advance on our first study, still omitted many civil wars and has been subject to considerable challenge and debate. We have attempted to make the results in this paper more definitive. The sample has nearly doubled to over 1,000 observations, the period of analysis has been brought up to end-2004, and the quality of the data has been considerably improved. Our results are important in two respects. First, despite the challenges, the core results of our previous analysis all survive. In particular, economic characteristics matter: namely, the level, growth, and structure of income. Secondly, two new variables are found to be both significant and quantitatively important. These are whether the country was under the implicit French security umbrella and the proportion of its population who were males in the age range 15–29. We also found some weaker evidence that mountainous countries are more conflict prone. Not only are these three variables important in their own right, from our perspective their key significance is that for the first time variables are significant which can reasonably be interpreted in terms of the major theoretical divisions. As we discuss in our review of theory, the basic division between theories of civil war is those that focus on feasibility, and those which focus on motivation, which in turn has two variants, 'greed' and 'grievance'. The three new variables point to the primacy of feasibility over motivation, a result which is consistent with the feasibility hypothesis. The feasibility hypothesis proposes that where rebellion is feasible it will occur: motivation is indeterminate, being supplied by whatever agenda happens to be adopted by the first social entrepreneur to occupy the viable niche, or itself endogenous to the opportunities thereby opened for illegal income.

An implication of the feasibility hypothesis is that if the incidence of civil war is to be reduced, which seems appropriate given its appalling consequences, it will need to be made more difficult. This is orthogonal to the rectification of justified grievances, the case for which is implied directly by the concept of 'justified grievance' without any need to invoke perilous consequences from the failure to do so.

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Appendix: data sources

Democracy

We measure democracy with the democracy indicator from the Polity IV data set. It ranges from 0 (autocratic) to 10 (fully democratic). Data source: http://www.cidcm.umd.edu/inscr/polity/

Economic growth

Using World Bank World Development Indicators (WDI) data for GDP *per capita* we calculated the annual growth rates (World Bank, 2006).

Former French African colony

This dummy takes a value of one for the following countries: Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Congo, Rep., Cote d'Ivoire, Djibouti, Gabon, Guinea, Madagascar, Mali, Mauritania, Niger, Senegal, Togo. This variable is zero for all countries for the last period 2000–04.

GDP *per capita*

We measure GDP *per capita* annually. Data are measured in constant 1995 US dollars and the data source is World Bank, 2006.

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Peace

The number of years since the end of the last civil war. If the country never experienced a civil war we count all years since the end of World War II.

Population

Population measures the total population, in our regressions we take the natural logarithm. Data source: World Bank, 2006.

Primary commodity exports

The ratio of primary commodity exports to GDP proxies the abundance of natural resources. The data on primary commodity exports and GDP were obtained from the World Bank. Export and GDP data are measured in current US dollars.

Social, ethnolinguistic, and religious fractionalization

We proxy social fractionalization in a combined measure of ethnic and religious fractionalization. Ethnic fractionalization is measured by the ethno-linguistic fractionalization index. It measures the probability that two randomly drawn individuals from a given country do not speak the same language. The religious fractionalization index measures this probability for different religious affiliations. The fractionalization indices range from zero to one. A value of zero indicates that the society is completely homogenous whereas a value of one would characterize a completely heterogeneous society. We calculated our social fractionalization index as the product of the ethno-linguistic fractionalization and the religious fractionalization. Data source: Fearon and Laitin (2003).

Warstarts

Our main measure is based on Gleditsch (2004) and can be downloaded from http://weber.ucsd.edu/~kgledits/expwar.html (12 July 2006). Our alternative measure comes from the Armed Conflict Database (Gleditsch *et al.* 2002) and can be found on http://www.prio.no/page/CSCW_research_detail/Programme_detail_CSCW/9649/45925.html (12 July 2006).

Young men

We define this variable as the proportion of young men aged 15–49 of the total population (%). Data Source: UN Demographic Yearbook 2005

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