

# Structural causes of civil conflict: using fs/QCA to improve civil war prediction

Eelco van der Maat

Vanderbilt University

eelco.van.der.maat@vanderbilt.EDU

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## Abstract

This paper examines the value of configurational models for conflict prediction. Improving our ability to predict conflict is not only essential for conflict prevention, but creating increasingly robust models could also greatly improve negative case selection within conflict research. As models of conflict prediction that focus on the necessary causes of conflict could guide us to cases in which conflict is likely but does not occur. Although parametric regression models and formal strategic choice models have both greatly improved our understanding of the conflict process, actual prediction remains elusive. Some of the difficulties with conflict prediction may be solved if we could meaningfully differentiate between structural factors - e.g. state failure - that facilitate conflict and trigger factors that ignite conflict. Guided by quantitative research by Fearon & Laitin (2003), this paper adopts a combinational approach to discern between the structural and immediate causes of civil war onset. This paper examines the added value of Novel methods designed to show necessary and sufficient causation such as fs/QCA and asymmetric correlational analysis for conflict prediction. Results show that Ethnic or Religious fractionalization, mountainous terrain, low development and highly authoritarian regimes are generally necessary for civil war onset.

It is debatable whether it is even possible to predict conflict. For, as Gartzke (2003) compellingly argues war may well be the error term; there are some likely immediate causes of war that we simply cannot observe. Although these doubts about the actual feasibility of conflict prediction are real, we should nevertheless set out to approximate the deterministic causes of civil conflict as far as possible. For the potential boons are real as well. The value of conflict prediction is evidently linked to prevention. Given the huge

material and immaterial costs of armed conflict it is hardly surprising that conflict prevention remains the holy grail of conflict research. Viable research into conflict prevention should logically be preceded by improvements in our means of conflict prediction. Not only because prediction would aid efficient allocation of limited resources towards prevention, but more importantly because increasingly robust predictive models would also greatly improve negative case selection within conflict research. Specifically, predictive models of conflict may guide us to those cases in which conflict is likely but does not occur: negative cases which are necessary for the further examination of conflict prevention (See Mahoney and Goertz). Improving our predictive models of civil conflict should therefore remain a focus of conflict research despite issues of feasibility.

In an attempt to push prediction towards its limits and to approximate the sufficient causes of civil conflict, I would like to adopt here the seemingly radical viewpoint of determinism. Although parametric regression models and formal strategic choice models have both greatly improved our understanding of the conflict process, actual prediction remains elusive. Regression models may show conflict likeliness to change in a given case from .052 to .189, but we cannot claim that we correctly predicted conflict if it subsequently occurs, nor if it does not. Now, as a thought experiment, let us assume that causality is not probabilistic, but deterministic in nature i.e. we expect the right combination of causal factors to always produce civil war. That there exist necessary causes that are required to enable civil conflict to erupt and that there exist sufficient causal combinations that act as triggers for conflict onset when the enabling necessary causes are present. In a deterministic world we would expect the occurrence of civil war to be a subset of enabling necessary causes, whereas the triggering sufficient causes and causal combinations should be subset of the occurrence of civil war.

Obviously, we cannot realistically grasp the full causal complexity of civil conflict even if the social world were to be fully deterministic, due to limitations of observation and measurement. We may even wonder whether sufficiency actually exists in the social world. However, even an originally deterministic concept such as sufficiency may actually be conceived in a probabilistic manner. Given the nature of our research subject we would be perfectly satisfied to find a given causal combination to be likely to produce civil conflict or cause conflict most of the time. However, adopting a mindset open to determinism may allow us to be open to asymmetric causation; the fact that necessary and sufficient causal combinations may exist helps us to discern between structural, enabling factors and trigger factors.

Arguably we do not need to adopt determinism for non-trivial necessity to be fully part of the ways social scientists think about causality. In civil war

research, for example, we can think of necessary causes as enabling causes, which are likely structural in nature.<sup>1</sup> Because not all necessary causal relationships are equally important, it is important to distinguish between meaningful and trivial necessary causes. We know for example that oxygen is necessary for civil war, but it is clear that oxygen is a trivial necessary cause of civil war because it is required for human life and therefore for all social phenomena. Still, one could think of potential necessary causes in the civil war literature that are quite meaningful. For example, certain terrain features, such as mountains or Jungle, may allow insurgents to avoid government forces (Fearon & Laitin 2003), and may therefore enable civil conflict, without actually causing civil conflict. It is perfectly possible that rebels require these types of terrain to conduct large scale armed conflict with the government. If so we should find that countries that experience civil war are a subset of countries with mountainous or heavily forested terrain.

Moreover, although necessary causes are less directly related to the outcome than sufficiency, addressing the necessary causes of war will make civil war less likely. Furthermore, necessary causes tell us when civil war cannot occur, which is especially important for the selection of relevant cases. Civil war is a rare event and only a very small part of the research population experiences civil war at a certain point in time. Therefore, many cases are extremely unlikely to ever experience civil war and are consequently irrelevant to the study of civil war. Including these irrelevant cases may create serious selection bias in the analysis of rare events. (Mahoney & Goertz 2006) Necessary causes tell us in which part of the population civil conflict can actually occur and therefore allows us to focus our analyses on these cases, leaving irrelevant cases that lack the necessary conditions out of our analysis. This study aims to discern the necessary and sufficient causes for civil war onset. By means of a combinational approach that relies on fuzzy set Qualitative Comparative Analysis (fs/QCA) (Ragin 2000, 2008) and a simple Multivariate Test for Asymmetric Hypotheses (Clark, Gilligan, & Golder 2006) this paper sets out to unravel necessary and sufficient causal combinations using replication data from Fearon and Laitin (2003) that had a great impact on civil war research. Before turning to the use of the relatively new method of fs/QCA for large N analysis, let us turn towards the potential causes of civil war onset.

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<sup>1</sup>Note that even though necessary causes are likely to be more structural in nature this does not need to be the case; we can imagine a case in which a sufficient cause is present, but the outcome is cannot occur because it does not satisfy necessity. In this case the necessary cause may well be perceived as the trigger factor.

## **Greed, grievance and feasibility incubation times**

The previous decade witnessed the accumulation of a solid body of knowledge with respect to the onset of civil war through the adoption of large scale quantitative studies (e.g. Fearon and Laitin 2003; Fearon et. al. 2007; Collier and Hoeffler 1998, 2004; Collier et al. 2009; Regan & Norton 2005; Sambanis 2004). The main theoretical debate with respect to the onset of civil war revolved around the question whether civil war onset can best be explained by greed or grievance as posed by Collier and Hoeffler (1998 & 2000?) on the one hand or by opportunity structures argued Fearon and Laitin (2003) on the other. In this debate, greed stands for the private gains that motivate and aid a rebellion; grievance focuses on relative deprivation and inequality of large groups of people that fuel the willingness to go against the central government; and opportunity relates to the structural environment that a rebellion requires to survive.

In their 1998 and 2004 articles Collier and Hoeffler find that the availability of finance is conducive to civil war onset, particularly in the form of natural resources, but also in the form of diasporic support. The availability of exploitable resources may both provide an incentive for the capture of state power and state revenues as well as pay for the rebellion itself. These lootable resources offer the opportunity for rebel leaders to provide economic incentives to the rebel soldiers (See also Regan & Norton 2005). However, Collier and Hoeffler also argue that resource revenues empower the central government as well and that exceptionally large deposits will therefore make civil war less likely to erupt. Note that Fearon and Laitin (2003) find no relation between civil war onset and the presence of natural resources, however, and Fearon (2005) attributes the Collier and Hoeffler (2000) findings to the weak administrative capabilities of oil exporting countries.

Besides greed, Collier and Hoeffler (1998) posit grievance to signify the level of deprivation that may motivate rebellion. Testing for religious and ethnic fractionalization they find civil war to be more likely in polarized societies. Societies are most polarized when they consist of two similarly sized factions in contrast to homogeneous and highly fractionalized societies (Collier & Hoeffler 1998, 2004; Collier et al. 2009); a finding supported by Regan and Norton (2005). Fearon and Laitin (2003), however, find no evidence for ethnic and religious fractionalization as a cause of civil conflict. Regan and Norton (2005) make a distinction between grievance as caused by relative deprivation and by inequality. Relative deprivation refers to the individuals perception of deprivation relative to its own personal belief of unfulfilled potential, whereas inequality represents the individuals perception of deprivation in relation to the opportunities of others (Regan and Norton

2005). They find relative deprivation to be less likely to cause individuals to mobilize against the government than absolute poverty.

Fearon and Laitin (2003) find that opportunity structures or the conditions that favor insurgency are likely to be the best predictor of civil war; a finding supported in part by Collier, Hoeffler, and Rohner (2009). As only a relatively small number of highly determined individuals is required to start and sustain a rebellion, motivation is unimportant. Wherever the right opportunity structures are present, civil war will eventually break out; or in the words of Collier, Hoeffler, and Rohner (2009) “where a rebellion is financially and militarily feasible it will occur”. Specifically, Fearon and Laitin (2003) determine that countries experiencing poverty, state weakness<sup>2</sup>, or have rough terrain or a large population are more prone to insurgency.

Grievance and feasibility will provide the starting point for the current study. However, it is helpful to make a further temporal distinction as well. More specifically, the causal mechanisms for civil conflict may affect onset within different timeframes. Specifically, we may find that some predicted causes of conflict affect the occurrence of civil war immediately whereas others have a more structural effect. In essence we can expect the causal mechanisms of civil war to span a continuum ranging from unchanging structural causes on to volatile immediate causes. On the one end of the spectrum, structural causes may be more readily observed, are likely necessary in nature and although they do not allow us to actively affect civil war onset, they do help us discern which states are generally at risk. More immediate causes, on the other end are very hard to observe, but are likely sufficient and therefore may allow for more policy options. For conflict prediction structural and intermediate causes are likely most promising.

Based on the assumption that there is conceptual merit to the differentiation between necessary and sufficient causation, this paper attempts put fs/QCA to the test as a means of data analysis and see whether it may further our understanding of these processes, using replication data from Fearon and Laitin (2003). More specifically, I examine whether grievance as measured by *low economic development* and *ethnic or religious fragmentation* or feasibility as measured by *mountainous terrain, no low population, new state, and non-contiguous state* are necessary or sufficient for civil war onset. *Oil as a*

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<sup>2</sup>Note that though Fearon and Laitin (2003) make an appealing case for state weakness and anocracy as a major determinant of civil war. The polity measure they use in their dataset is taken from Policy Index that includes civil war as a component variable. (Vreeland 2008) Because Fearon and Laitin (2003) examines onset and lag their polity measure this does not create any direct problems. Similarly, this study deals with this problem by taking a measure of time till onset as a dependent variable. Still this is not a magic fix and readers should be aware of the problems associated with the Polity data.

*percentage of exports* will also be taken into account as an imperfect measure of both greed and feasibility. It is expected that some of the variables that form the basis of the greed, grievance, and feasibility hypotheses will be necessary in nature whereas others will part of sufficient causal combination. It is not entirely clear which predictor variables will be more necessary and which will be more sufficient in nature, but one would expect that variables based on feasibility will at least be necessary. It is conceivable that causes<sup>3</sup> that are found to affect civil war in some studies, but not in others seem ambivalent because they are asymmetric in nature. If this is the case we should be able to discern them using fs/QCA.

## **Method and Research design**

The data is taken from Fearon and Laitin (2003) and contains 6610 cases of country year data running from 1945 till 1999. In order to determine probabilistic necessary and sufficient causal configurations of civil war onset the data was examined using fuzzy set Qualitative Comparative Analysis (fs/QCA) (Ragin 2008, 2000, 1986; Ragin et al., 1996). Fs/QCA is a cross-case method that has its basis in set theory and that offers the possibility to systematically study a small to intermediate number of cases in depth while also arriving at valid causal statements, including interaction effects and generalizations (Ragin 2008, 2000). Though the analogy is not entirely accurate, fs/QCA can most easily be explained as a combination of a most similar and most different design that allows for full causal complexity: it is a qualitative configurational approach that allows us to discern both necessary causes and sufficient causal combinations (Ragin 2008, 2000).

Fs/QCA uses fuzzy sets to determine the degree of membership in a set. Through the use of fuzzy sets it is possible to calibrate partial set membership. As such, an observation can have membership in a set running from 0.0 (non-membership) to 1.0 (full membership). Membership that approximates the .5 cut-off point becomes increasingly ambiguous, whereas membership is out of or in the set with increasing certainty as it approaches 0.0 or 1.0 respectively. (Ragin 2008) As such, fuzzy sets allow for a level of error and for a probabilistic world view as well. Depending on the nature of the data fuzzy sets can be more or less fine grained. In this paper quantitative data was computed to create very fine grained fuzzy sets.

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<sup>3</sup>Some proponents of QCA methods argue that terms like variables should not be used because they may blur the distinction between configurational and correlational net effect approaches. Though I agree it is important make a clear distinction, I believe that adapting a completely separate terminology will only hamper debate.

A fuzzy conception of onset can help us deal with the problems related to country year data. Country year data are commonly used in International Relations, but are not without problems. Though, they are the default for quantitative studies, this default is essentially random. We need not stretch our imagination too far in order to consider that many of the processes that may cause civil war onset change little over years, whereas others can change quite rapidly. Also it is debatable whether civil war will immediately occur when the conditions for civil war are right. We can think of civil wars as needing a trigger. However, before we can find this trigger we may do well by turning towards more long-term, structural causes for civil war onset.

In order to discern the causal mechanisms that allow us to predict conflict, the period preceding the conflict is likely of central importance. However, we do not know the length of the period because we do not know the incubation time, so to speak. To focus the analysis on the time preceding civil war onset, one has to determine the time until the outbreak of the war, if any. For a subset of cases we can discern civil war at a certain time and therefore we can calculate a measure of time in years until the onset of the civil war. In some cases we can discern multiple conflicts, in which case the time from the end of the war till the next war is of interest. Country years that have civil war occurring likely contain only scrambled information on the time till the onset of the next war. Therefore these cases were dropped from the analysis. In a large subset of cases we cannot discern future conflict. Either because the conflict will not occur because it lacks the necessary and sufficient causes needed, or because the conflict has not yet occurred. There are several ways around this problem of Right-Censored observations in the data. Here, I deal with this problem by dropping the five most recent years of data from the analysis.<sup>4</sup> The number of years dropped depends on how we operationalize our fuzzy concept of onset.

I assume that as we move closer in time towards an observable conflict we are more likely to find the necessary and sufficient causes of the conflict onset. Preceding every conflict there is some period that will contain all of the causal factors. We may even assume that for the majority of conflicts, many of the causal processes of interest may be present even years before the actual outbreak of the conflict. The period of interest preceding the conflict may therefore run from several years before the conflict till the conflict and will likely differ per conflict. In order to capture this period of interest I construct a fuzzy measure of onset. Therefore we need to make several assumptions

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<sup>4</sup>We know that these cases at least did not experience war until the end of our data set, so we are losing information by dropping them. Though there are ways to deal with these problems in correlational net effect duration analysis, I am yet to find a satisfactory way to retain these cases using configurational methods.

with respect to the period of interest. In order to be able to capture both the predictor variables in our data that change a lot over time and the structural enabling causes such as terrain that do not change at all, I tested two models: one to discern necessary variables that change over time and the second for structural necessary causes that do not change over time. Because the fuzzy tests for necessity test each predictor variable independently of other variables we can set a longer or shorter period of interest depending of the nature of the variable. With sufficient variables this is not possible, however, and we therefore need to go with a single model for the entire analysis.

The first model has a short to intermediate term period of interest whereas the second model takes time to onset out of the analysis and only tests whether war occurs in the future. More specifically, the first model has a fuzzy conception of time till onset: it assumes 1) that the period prior to a decade before the start of the conflict is definitely out the period of interest; 2) that the period from two years before the conflict is definitely in the period of interest; and 3) that the cut-off point for the period of interest is five years before the onset. The latter means that from 10 till 5 years preceding the conflict the case is more out than in the period of interest and from 5 till 2 years the case is more in than out. By changing the parameters we can further examine whether different periods contain more or less information, but this lies outside the scope of the current paper.

Many of the variables in our data do not actually change over time, either because of the unchanging nature of the predictor variable i.e. mountainous terrain or because of the limitations of measurement i.e. ethnic OR religious fractionalization, and non contiguous state. The Second model takes into account that some predictor variables do not change over time, and that variation in the time till onset therefore does not provide us with additional information on the necessity of these predictor variables. More specifically, the second model assumes that the entire period prior to the start of a conflict is in the period of interest generating a single observation. Therefore a our outcome variable will be 1 if there is a conflict at any point in the future and 0 if a future conflict has not (yet) occurred. If we take the future occurrence of war as the outcome variable it is no longer appropriate to use country-year as the unit of analysis. Therefore only the first year that a country enters the dataset is included. Furthermore, in order to reliably capture structural causes, Model two consequently captures the necessity of structural predictor variables that do not vary over time.

Before going into the construction of the predictor variables let us turn to the potential issues with using QCA for large N analysis, namely lack of detailed case knowledge and reduced consistency. Fs/QCA was originally designed to be a qualitative method of analysis in which the researcher

has intermediate number of cases (20-50) and a deep and substantive case knowledge. Deep case knowledge may both aid the calibration of variables and allow us to better assess the value of discerned causal patterns. However, with the advances offered in Ragin (2008) it has become possible to calibrate large-N quantitative data if the researcher can assign the values at which any case is definitely in, definitely out, or at the cut-off point. It does remain essential to evaluate discerned causal patterns, but this can be done through within-case analysis in selected cases, such as process tracing, thereby limiting the need for expert knowledge of all the cases under analysis. Furthermore, as demonstrated below, it is possible to strengthen the validity of large-N fs/QCA results by comparing them to results generated by simple OLS regression.

The second problem that arises in the use of fs/QCA for large N analysis is that consistency is likely to decrease somewhat. Consistency is a measure introduced in Ragin (2000) and further improved in Ragin (2008) that determines the degree to which a perfect subset relation can be established. The decrease in consistency is neither surprising, nor problematic as perfect consistency can generally only found when the N is small. Readers familiar with QCA should note that even though near perfect consistency may be required to make any claims of necessity or sufficiency in a small-N analysis. One would, however, not need perfect consistency to make claims of necessity or sufficiency in a large-N analysis and I will therefore adopt a threshold consistency of .70.

Recall that grievance and feasibility are examined using predictor variables constructed from independent variables used in Fearon and Laitin (2003). More specifically, the variables examined in this study are *mountainous terrain*, *Oil as a percentage of exports*, *new state*, *low economic development*, *no low population*, *ethnic or religious fractionalization*, *Authoritarian regime* and *non-contiguous state*. Following Ragin (2008) predictor variables measured at the interval level where constructed using the direct method of calibration -i.e. calculated using a log based on the qualitative anchors-, whereas nominal and ordinal variables where calibrated using the indirect method of calibration -i.e assigning values on the basis of the qualitative anchors. The fuzzy construction and calibration of these variables, including the fully in, fully out, and cut-off values of these variables are presented in table 1 below.

TABLE I HERE \_\_\_\_\_

One goal of this paper is to differentiate between cases that may exhibit conflict and irrelevant cases. Therefore, I will first test for potential necessary causes using fs/QCA. Any necessary relations that are uncovered will provide scope condition for the further analysis of sufficiency. For, cases that lack the necessary causes of civil war onset cannot by nature of necessity experience civil war and therefore belong to the set of irrelevant cases. Dropping these irrelevant cases reduces selection bias and therefore improves our further analysis of sufficiency. In order to be better able to evaluate any discerned necessary or sufficient causal patterns, we can compare the results of the fs/QCA analysis to conventional large-N correlational approaches. I do so by running a simple multivariate test for asymmetric hypotheses as propagated by Clark, Gilligan and Golder (2006) and contrast the results with those from the CQA analysis.

## **Results: fuzzy set Comparative Qualitative Analysis**

The outcomes of the fs/QCA test for necessity are presented in Table II. Model 1 takes a shorter period of interest as the outcome variable and is therefore more appropriate to study predictor variables that change over time, whereas model 2 removes duration from the analysis and therefore gives a better indication of the more structural predictor variables. As we can see in table II a low level of development and High Authoritarianism are consistently necessary and for civil war with consistency values of 0.953 and 0.818 respectively, with a respective coverage of 0.101 and 0.094. Whereas the analysis of structural necessity shows that ethnic or religious fractionalization and mountainous terrain are likely necessary for civil conflict with a respective consistency of .841 and 0.745 and a coverage of 0.458 and 0.541. These results indicate means that for a country to experience civil war, there likely need to be Ethnic or Religious fractionalization, some mountainous terrain, a low level development, and a highly authoritarian regime.

TABLE II HERE \_\_\_\_\_

In a sense structural necessity is key to selecting relevant cases in which the outcome has a real chance of occurring. Although there are likely to be cases of civil war that do not have mountainous terrain or Ethnic or religious fractionalization (hereafter also Ethno-religious fractionalization), we expect the subset of cases that do display these structural necessary causes to at least be fully in the set of potential conflicts. However, we cannot include

these structural causes directly in the analysis of sufficiency because they do not vary across time and therefore will be of no help discerning time until onset. We can, however, select cases for the sufficiency analysis on the basis of the structural factors. This will allow us to discern the relevant sufficient causes for civil conflict in the subset of cases that we know can actually experience the outcome. Furthermore, let us here include non-western as a necessary cause. Although we are not entirely certain what the underlying causal mechanisms are, we know that western states experience little civil war and that western states are therefore less likely to be in the relevant set. Based on the necessary analysis I assume that countries that display ethnic or religious fractionalization, have some mountainous terrain and are non-western are at risk of civil war. By selecting only those cases that display at least more than 0.5 on these necessary conditions we will be certain to have a subset of cases in which civil can actually occur given the right sufficient conditions which can both be combinational or correlational in nature.

The results of the tests of sufficiency among the subset of cases that are at risk are shown on table III below. The model incorporates oil exports, non contiguous state, new state, low development, high democracy and high authoritarian. From the analysis it becomes clear that noncontiguous states of which oil makes up for more than 1/3 of their exports will likely experience civil war within 5 years if the necessary causes of low development and highly authoritarian regime are present, with a consistency of .839 and a coverage of .053. The fact that the coverage is quite low tells us that only a small subset of civil wars is explained by cases that comprise of these causal combinations.

TABLE III HERE \_\_\_\_\_

Let us now use simple OLS regression to put these results in a more familiar light. I ran two linear regression models in order to contrast their outcomes with the outcome of the fs/QCA models. One should note, however that linear regression models are not the most appropriate for dealing with time duration data. Still, although time duration models such as the Cox model are better equipped to deal with left truncation and right censoring, simple OLS regression models do serve a purpose here. As they do allow us to better aducate the findings from the QCA analysis without changing the fuzzy onset variable. More specifically these two models should independently support the necessary nature of ethnic and religious fractionalization

for the occurrence of civil conflict.<sup>5</sup> The first model is a simple regression of the independent variables over the at-risk population (i.e. countries that display ethno-religious fractionalization, have some mountainous terrain, and are non-western.) The cases analyzed in the second model are only selected on mountainous terrain and non-western, and are not selected on Ethnic or religious fractionalization. Instead ethnic or religious fractionalization is included as interaction term that interacts with all other variables as a necessary condition. In the second model the interaction terms for Ethno-religious fractionalization should show an independent effect in order to be considered necessary.

Model 1 shows that all of the variables that we would expect to contribute based on the QCA analysis do indeed contribute to civil war onset (see table IV below). The OLS regression further shows us that non-contiguous, oil exports, low development and a highly authoritarian regime may all be seen to independently contribute to civil war onset. The second model shows us that ethnic or religious fractionalization is necessary for most of the independent variables. Note that coefficients in models with interaction terms show the effect of the coefficients when the interacting variable here ethno-religious fractionalization is 0. As such they cannot simply be read from the table. (Brambor, Clarck & Golder 2006) Although it is possible to graph the effects of the coefficient for every value of ethno-religious fractionalization, these graphs fall outside the scope of the current paper. We can see from the OLS regression that the effects of the predictor variables increase when ethnic or religious fractionalization is present, which strengthens the claim the ethno-religious fractionalization is necessary for civil war onset. However, not that for ethno-religious fractionalization to be purely necessary we would not expect to see any independent effect of the other coefficients when ethno-religious fractionalization is zero (Roberts et al. 2006).

TABLE IV HERE \_\_\_\_\_

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<sup>5</sup>I test for Ethnic or Religious fractionalization as an example because it is contested as a cause of civil war onset.

## Conclusion

The present study has examined the necessary and sufficient determinants for civil war onset. A combinational approach of fs/QCA and asymmetric regression analysis has revealed that both grievance and feasibility likely contribute to the occurrence of civil conflict. Specifically, it appears that *mountainous terrain, ethnic or religious fractionalization, low development* and *a highly authoritarian regime* are necessary for civil war onset. These necessary causes factor in combination with *being a non-contiguous and oil exporting state* were found to be sufficient to cause civil conflict within two to five years. These findings may present new venues for further research into the sufficient causes of civil war.

Contrary to earlier studies, the current analysis of necessary and sufficient relations shows that both feasibility and grievance contribute to civil war onset. More specifically, both grievance, as measured by *low economic development* and *ethnic or religious fragmentation* as well as feasibility as measured by *mountainous terrain* are necessary for conflict onset. Moreover, I find little evidence of feasibility being sufficient for civil war onset. As was to be expected the predictor variable *mountainous terrain*, which is most strongly based on the feasibility hypothesis, is necessary rather than sufficient in nature. On the other hand, *being a non-contiguous state*, is sufficient for civil war when combined with *oil exports*. The causal mechanisms for civil war onset of non-contiguous states are unclear, however, and do not necessarily point towards feasibility. For, in order for non-contiguous state to support the feasibility hypothesis, we would expect rebels in the non-contiguous part of the state to attempt secession. In many cases, however, the civil strife is between factions in the contiguous part of the state. Therefore I expect the sufficiency of the non-contiguous nature of a state to be indicative of some other sufficient cause or causal combination that we capture by looking at whether a state is contiguous; perhaps this is because we may find noncontiguous states in regions where stable contiguous borders for some unobserved reason are especially difficult to form. If so, we would expect these places to be more likely to experience civil war.

Furthermore, contrary to the findings in Fearon and Laitin (2003), I find that ethnic or religious fractionalization does have a likely causal effect, albeit a necessary one. The reason that ethno-religious fractionalization is only found to be a cause for conflict in some studies and not in others may well be because it is not independently sufficient for civil conflict. Due to its asymmetric nature, standard regression analysis is ill equipped to discern its impact on the occurrence of civil war. QCA analysis and interaction models show, however, that ethno-religious fractionalization may actually be con-

sidered a highly important necessary cause for civil conflict. Ethno-religious fractionalization and other necessary causes for civil war are especially important because they may provide us with scope conditions for case selection that may allow us to better discern the actual sufficient causes of civil war onset. For, our knowledge of the sufficient causes of civil war still seems to be extremely limited. This study indicates that the main known causes of civil war onset are likely more necessary than sufficient in nature and therefore our knowledge of sufficiency remains very much uncharted. The only sufficient relationship suggested by the current study of non-contiguous oil exporting states has both a very limited coverage and underlying causal mechanisms remain unclear. Further research is necessary to uncover the more immediate and sufficient causes of civil conflict, selecting cases on the basis of necessary causes could be a good place to start.

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Table 1: Fuzzy set construction

Predictor Variable	Calibration	Fully Out	Fully In	Cut-off Point
% of Mountainous Terrain	Direct	10	0	5
Oil as a % of exports	Indirect	more than 30%	equal or less than 30%	-
Max. 2 years of statehood	Indirect	0	1	-
Low Economic Development (GDP/pop in \$1000)	Direct	10	2.5	5
No low population (pop size in millions)	Direct	2.5	20	5
Ethnic OR Religious fragmentation	Direct	0.00	0.65	0.35
Non contiguous state	Indirect	0	1	-
Highly Authoritarian regime (polity)	Direct	0	-10	-7.5
Highly Democratic regime (polity)	Direct	0	10	7.5

Table 2: Necessity

Causal factor	Model 1.		Model 2.	
	test of short term necessity		test of structural necessity	
	Consistency	Coverage	Consistency	Coverage
Ethnic OR Religious fractionalization	(.893)	(.095)	<b>.841</b>	<b>.458</b>
Low level of development	<b>.953</b>	<b>.101</b>	-	-
Some Mountainous Terrain	(.804)	(.110)	<b>.745</b>	<b>.541</b>
No low population	.693	.101	-	-
Non- contiguous	(.154)	(.081)	.177	.478
Highly Authoritarian	<b>.818</b>	<b>.094</b>	-	-
Highly Democracy	.225	.060	-	-
New State	.060	.158	-	-
Oil	.135	.089	-	-
Non western	-	-	<b>.968</b>	<b>.513</b>

Table 3: Sufficiency for Countries at risk

Causal combination	Consistency	Raw Coverage	Unique coverage
Low development * Authoritarian * Non-contiguous * Oil	.839	.053	.053

Table 4: test for necessity using OLS regression models

Causal factor	Model 1.	Model 2.
	Fuzzy onset (at risk set)	Fuzzy onset Interaction
Ethnic OR Religious fractionalization (ERF)	-	-0.230*** (0.079)
Noncontiguous State (NC)	0.139*** (0.022)	0.957*** (0.206)
New state (NS)	0.029 (0.036)	0.132 (0.124)
>1/3 export revenue from fuels (OIL)	0.046* (0.021)	-0.148* (0.060)
GDP/ pop (GDP)	-0.023*** (0.004)	0.021 (0.011)
Fuzzy Highly Authoritarian (AUT)	0.105*** (0.021)	-0.345*** (0.082)
Fuzzy Highly Democratic (DEM)	-0.019 (0.027)	0.088 (0.117)
Int 1) ERF*NC	-	-0.862*** (0.217)
Int 2) ERF*NS	-	-0.112 (0.140)
Int 3) ERF*OIL	-	0.221** (0.070)
Int 4) ERF*GDP	-	-0.047*** (0.013)
Int 5) ERF*AUT	-	0.497*** (0.094)
Int 6) ERF*DEM	-	-0.119 (0.141)
GDP/ pop	-0.092*** (0.017)	0.299*** (0.069)
R2	0.059	0.062
N	2292	2594

Note that the dependent variable is a continuous fuzzy set

Standard errors are in parenthesis.

p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001