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**Why Do Some Oil Exporters Experience Civil War
But Others Do Not?
A Qualitative Comparative Analysis of
Net Oil-Exporting Countries**

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Why Do Some Oil Exporters Experience Civil War But Others Do Not? – A Qualitative Comparative Analysis of Net Oil-Exporting Countries

Abstract

According to quantitative studies, oil is the only resource that is robustly linked to civil war onset. However, recent debates on the nexus of oil and civil war have neglected that there are a number of peaceful oil-rentier states, and few efforts have been spent to explain why some oil-exporting countries have experienced civil war and others have not. Methodologically, the debate has been dominated by research using either quantitative methods or case studies, with little genuine medium-N comparison. This paper aims to fill this gap by studying the conditions of civil war onset among net oil exporters using (crisp-set) Qualitative Comparative Analysis (csQCA). Considering a sample of 44 net oil exporters between 1970 and 2008, we test conditions such as oil abundance (per capita) and dependence, the interaction of ethnic exclusion and oil reserve locations (overlap) as well as the type of political regime (polity). Our results point to a combination of necessary and sufficient conditions that has been largely ignored until now: low abundance is a necessary condition of civil war onset. Two pathways lead to civil war: first, a combination of low abundance and high dependence and, second, a combination of low abundance and the geographical overlap of ethnic exclusion with oil reserve areas within autocracies.

Keywords: civil war, oil exports, resource curse, rentier state, QCA

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Zusammenfassung

Warum sind einige Erdöl-Exporteure in Bürgerkriege verwickelt und andere nicht? –

Eine qualitativ-komparative Analyse von Erdöl exportierenden Ländern

Quantitativen Studien zufolge ist Erdöl die einzige Ressource, die robust mit dem Ausbruch von Bürgerkriegen verbunden ist. Die bisherige Forschung hat bisher weitgehend außer Acht gelassen, dass es auch eine Anzahl friedlicher Rentierstaaten gibt. Es ist kaum untersucht worden, weshalb einige Erdöl exportierende Länder von Bürgerkriegen betroffen sind, andere dagegen nicht. In methodischer Hinsicht wird die Debatte zum Zusammenhang von Erdöl und Bürgerkrieg entweder von quantitativen Ansätzen oder aber Einzelfallstudien dominiert. Untersuchungen mit mittleren Fallzahlen fehlen fast gänzlich. Der vorliegende Beitrag möchte zur Schließung dieser Forschungslücken beitragen, in dem die Einflussbedingungen für Bürgerkrieg durch (crisp-set) Qualitative Comparative Analysis (csQCA) untersucht werden. Anhand eines Samples von 44 Erdöl exportierenden Ländern wird der Einfluss von Ölreichtum (pro Kopf), Ölabhängigkeit, der geographischen Überlappung von Erdöllagerstätten und exkludierten ethnischen Gruppen und der politische Regimetyp für die Periode 1970 bis 2008 untersucht. Die Ergebnisse deuten auf eine Kombination aus notwendigen und hinreichenden Bedingungen, die bislang keine oder nur wenig Beachtung fand. Zwei Kausalpfade führen zu Bürgerkrieg:

- Eine Kombination von geringem Reichtum an und hoher Abhängigkeit von Erdöl sowie
- eine Kombination geringen Reichtums und der Interaktion von Erdölvorkommen und ethnischer Exklusion in autoritären Regimen.

Why Do Some Oil Exporters Experience Civil War But Others Do Not? – A Qualitative Comparative Analysis of Net Oil-Exporting Countries

Matthias Basedau and Thomas Richter

Article Outline

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1 Introduction¹

According to the quantitative literature, oil seems to be robustly linked to the onset of civil war² (e.g. Ross 2004a; Dixon 2009). However, recent debates on the nexus of oil and civil war have neglected two major considerations: there are a number of peaceful oil-rentier states, and there have been few efforts to explain why some oil-exporting countries have experienced civil war and others have not. Methodologically, the debate has been dominated by research using either quantitative methods or case studies, with little genuine medium-N comparison.

¹ We are grateful to Tobias Böhmelt, Jörg Friedrich and Claudius Wagemann for extremely helpful comments on earlier version of this paper. We would also like to thank Georg Strüver and Hannes Bahrenburg for their excellent research assistance.

² If not indicated otherwise, civil war denotes an armed conflict (UCDP/PRIO definition) that has produced at least 1,000 battle-related deaths in a given year (see Gleditsch, Wallensteen, and Eriksson 2002).

This paper aims to fill this gap, researching why some oil-exporting countries experience civil war while others do not using a relatively new methodological approach: (crisp-set) Qualitative Comparative Analysis (csQCA), a technique best used to study samples of between 10 and 50 cases. QCA is also more suited to identifying necessary and sufficient conditions than most existing quantitative techniques. At the same time, this technique looks at country-specific configurations but outperforms case studies in yielding generalizable results.

The paper proceeds as follows. We first review the literature on the resource–conflict link, pointing to specific deficiencies. We then outline our general empirical strategy, first introducing csQCA. Subsequently, we present our dependent variable (civil war onset) and our independent variables (oil abundance; oil dependence; overlap of ethnic exclusion and oil reserves; regime type), which are then tested using a sample of 44 net oil exporters between 1970 and 2008. We then perform the analysis and discuss the results. We also point to a number of important model specifications and alternative pre-tests in order to increase confidence in our main results. Finally, we draw conclusions and highlight our contribution for existing debates on the determinants of civil war among resource-endowed countries.

2 Literature Review

2.1 Theoretical Approaches

Collier and Hoeffler's (2004; initially 1998) influential work on "greed and grievance" has inspired many studies on the link between resources and conflict. Collier and Hoeffler argue that abundance of primary commodities increases the likelihood of civil war onset by providing the opportunity for armed rebel activity and the related motive of "greed" rather than by spurring conflict-promoting grievances, such as the political and economic deprivation experienced by, for instance, ethnic or religious groups. These ideas have been further developed in the literature. Generally, natural resources can promote violence through three major causal mechanisms (Humphreys 2005; Ross 2004b; also Le Billon 2008):

- 1) *Motivation* to take up arms may result from resource-related grievances, such as ecological damage or the withholding of resource revenues; costs and benefits relating to resources are the driving forces of conflict.
- 2) Resources also provide the *opportunity* for conflict by making rebellion or warfare financially (or militarily) feasible, particularly through the "lootability" of resources.
- 3) Resources may make *indirect mechanisms* work, directly providing neither motive nor opportunity but exerting a detrimental influence on other areas such as state institutions (the "weak state") and socioeconomic development ("Dutch disease"), which in turn makes civil war more likely.

All of these mechanisms involve numerous contextual conditions, particularly resource-specific conditions (Basedau and Wegenast 2009). In fact, “resources” are a fairly imprecise concept. They have several characteristics that may influence their impact on peace and war. Among these characteristics are the resource type (oil, diamonds, etc.) and the mode of extraction, which affects the feasibility of rebellion. As Le Billon (2001) notes, the exploitation of “distant” and “diffuse” resources like alluvial diamonds, timber, or drugs can hardly be controlled by the central government. Hence, rebels can “loot” them more easily than deep-shaft gems or offshore oil, which would require sophisticated technical know-how.³

Moreover, a country’s resource dependence and abundance are not identical (Ross 2006: 266; De Soysa 2002: 8-9). Dependence means that rents from resources are the most important source of income *relative* to other value-adding activities, whereas abundance or wealth refers to the *absolute* resource rents available in per capita terms (or relative to global reserves or production).

Dependence and abundance have different implications for the likelihood of civil war (Basedau and Lay 2009). Resource dependence may be especially violence-enhancing at higher levels. Countries are vulnerable to price shocks, which in turn create economic crisis and (thus) make conflict more likely. Moreover, resources may foster the onset of internal conflict only in economies with a monolithic structure that offers limited alternative-income sources. In contrast, higher resource abundance per capita will probably foster peace when governments employ particular distributive policies.

According to rentier state theory (Luciani 1987), which has been largely disregarded in the debate over the resource–conflict link, governments can use resource revenues for costly policies such as large-scale re-distribution and security apparatuses, buying off potential dissidents or effectively suppressing rebellion.

Whether or not high rents will be available depends not only on output but also on input as part of resource governance. Careful management of the resource sector may include effective taxation structures (Snyder and Bhavnani 2005) and private rather than state ownership (Luong and Weinthal 2006). Moreover, rent income often disappears into the pockets of the elite or multinational companies. Relevant resource-specific conditions also include the external structure of demand. Powerful importing countries may be ready to intervene militarily, either directly or by supporting warring factions. All of these conditions have been declared to constitute a “key research agenda” (Collier and Hoeffler 2005: 627).

The likelihood of conflict may also depend on non-resource-specific characteristics such as the general level of development, relations between identity groups, geographical and demographical factors, the general quality of state institutions, and elite behavior. All of these conditions may affect the likelihood of violence independently of resources. Hegre and Sambanis (2006) have empirically identified non-resource-related conditions such as popula-

³ Such “point” resources are more likely to trigger power struggles over the control of the central state or, if concentrated in peripheral regions, secessionist uprisings (Le Billon 2001: 31).

tion size, income level and growth, and rough terrain as robust correlates of civil war. However, more importantly, resource- and non-resource-specific conditions are likely to interact (Basedau and Wegenast 2009). For instance, the relationships between identity groups will be affected when resources are located in a region that does not get a fair share of the revenues but instead has to suffer from ecological or socioeconomic stress connected to resource production. It is also likely that the type of regime, democratic or not, effective or weak, will matter (Hegre et al. 2001).

2.2 Results from Quantitative Studies

Numerous quantitative studies have tried to demonstrate that natural resources increase the risk of civil war onset; their results vary. Ross (2004a) has analyzed 14 quantitative studies of the resource–conflict link and finds that primary commodities as a whole cannot be robustly linked to civil war onset or duration. According to his conclusions, the type of resource definitely matters. Whereas no study under review by Ross can establish a relationship between agricultural commodities and violence, “lootable” resources such as narcotics, timber and (alluvial) diamonds seem to influence the duration of a conflict, although they do not make the onset of civil war more likely (Lujala, Gleditsch, and Gilmore 2005).⁴ Studies differ in their conclusions regarding whether diamonds cause or sustain civil war (Le Billon 2008: 352). Only oil-exporting countries seem to be particularly prone to civil war onset (Ross 2004a; Dixon 2009). Further studies question the notoriety of oil in this respect: Smith (2004) finds a positive effect of oil dependence on regime stability and peace in developing countries. According to Hegre and Sambanis (2006: 531), only oil exports (and not production of oil or production and exports of other resources) are marginally robustly linked to minor armed conflict. Others (Fearon and Laitin 2003; Fearon 2005) have concentrated their criticism on the opportunity or feasibility mechanism and propose that the oil–violence nexus works through a weak state (see Ross 2006: 290-291) or can be attributed to the effects of a “sparse network” (Humphreys 2005).

Recent studies have found evidence that certain rentier mechanisms are present within oil states. Fjelde (2009) finds that the interaction of high levels of corruption and appropriate resources (oil wealth) reduces the conflict proneness of a country by offsetting the destabilizing effect of resource abundance. According to Basedau and Lay (2009), oil dependence increases the risk of civil war onset, creating a U-shaped relationship, whereas high levels of abundance are apparently used to engage in large-scale distribution and the establishment of a huge and effective security apparatus.

⁴ They find that secondary diamonds are positively linked to the onset of ethnic civil wars only, as opposed to other kinds of civil wars, whereas primary diamonds lower the risk of civil war onset and duration in general.

2.3 Results of Small- & Medium-N Studies

Methodologically, research on the onset of civil war is dominated by quantitative studies. Although there are numerous case studies that provide country-specific evidence on the resource–conflict link, genuinely comparative perspectives – in particular medium-N studies – are rare. There are some edited volumes and monographs that compare several pertinent cases (e.g. Collier and Sambanis 2005; Oliveira 2007). A comparison of three diamond producers (Sierra Leone, Ghana and Guinea) by Snyder and Bhavnani (2005) shows that modes of extraction, the tax base from resource production, and spending patterns – as already suggested in the section above – influence the complex relationship between natural resources and civil war.

One of the few systematic small-to-medium-N studies in this debate is Ross (2004b). Ross explicitly and exclusively tests a number of causal mechanisms potentially leading to civil war onset using 13 cases in which resources and conflict are “most likely” interrelated. He finds evidence of neither opportunity-driven (“looting”) nor motive-driven (“grievances”) mechanisms for creating conflict, but he does find evidence of separatism in two cases (Sudan, Indonesia) and of two other mechanisms in three cases (Congo Republic: “future booty”; DRC: foreign intervention; Sierra Leone: foreign intervention and “future booty”). Empirical support for the mechanisms at work increases with conflict duration, particularly for “looting,” although some of the mechanisms have shortened the wars. However, the sample cannot explain differences in violence given the rather constant dependent variable, as Ross frankly admits (Ross 2004b: 49).

A study by Basedau and Lay (2009) uses both logistic regression and a medium-N analysis that concentrates on 27 highly dependent net oil exporters to isolate the possible effects of abundance and material rewards that may explain the absence or presence of civil war onset. According to this analysis, abundant income from resources is used to engage in large-scale distribution and the establishment of a huge and effective security apparatus. In addition, oil-abundant states often enjoy protection from abroad.

Wegenast and Basedau (2009) test a medium-N sample of 17 highly ethnically fragmented, low-income, and resource-rich countries. Their findings lend support to the assumption that the combination of ethnic exclusion and resource availability (here, oil and diamonds) renders civil war onset very likely. The authors’ medium-N study of Africa’s 15 main oil and diamond producers confirms these results. High dependence and minorities at risk in producing regions strongly increase the likelihood of civil war. Lower income from resources per capita and substantial production of lootable resources in peripheral regions are apparently necessary conditions for civil war.

In sum, three observations from previous research on the nexus of material resources and civil war onset seem important: First, oil (and oil exports) is the only resource that is more or less robustly connected to civil war. Second, relatively little effort has been invested in explaining the variation within the group of oil-exporting countries. The relatively few studies

on this subject that exist suggest that certain resource-specific characteristics (e.g. abundance, dependence, interaction of resources and ethnicity, and aspects of governance might be potential factors). Finally, research strategies other than quantitative approaches or single case studies are extremely rare. In particular, medium-N analyses are, with a few exceptions, virtually absent from the field. To the best of our knowledge, no study has ever tried to investigate the oil–conflict link via formal configurational methods such as csQCA using a medium-N sample.

3 Method and Operationalization

3.1 Crisp-Set QCA (csQCA)

Due to the binominal nature of our outcome (civil war onset) we decided to use crisp-set Qualitative Comparative Analysis (csQCA) in this paper as the primary method of data analysis.⁵ CsQCA belongs to a cluster of relatively new formal configurational data analysis techniques “concerned with the systematic matching and contrasting of cases to establish common causal relationships by eliminating all other possibilities” (Berg-Schlusser et al. 2009: 2). Introduced by the sociologist Charles Ragin (1987) during the late 1980s and developed further over the last two decades (e.g. Ragin 2008), QCA techniques have become an interesting complement to prevailing statistical approaches within macro-comparative research (Mahoney 2010). To the best of our knowledge, csQCA has rarely been used as a data analysis technique within the field of peace and conflict studies.

There is a consensus among experts on csQCA that a good configurational analysis will present at least three technical components (Schneider and Wagemann 2010; Rihoux and De Meure 2009): the truth table, the solution formulas, and measures of fit like coverage and consistency. The truth table presents the data to be analyzed, showing the conditions (the independent variables) as columns, the cases as rows and the value of the outcome (the dependent variable). However, the cases are not always confined to a single row but are rather grouped together if they are associated with a single combination of conditions relating to the same outcome. Using Boolean language, the solution formula shows the causally relevant conditions linked to the outcome.

⁵ In addition to crisp-set QCA (csQCA), where outcomes as well as conditions are binominal scaled, there are two other prominent QCA versions that have been used during the last couple of years. In multi-value QCA (mvQCA) the outcome is binominal and conditions are ordinal scaled. In fuzzy-set QCA (fsQCA), both outcomes and conditions are ordinal scaled. However, while fsQCA does not fit to the binominal nature of our outcome, the use of mvQCA due to a number of more recent concerns regarding its set-theoretical advantages over csQCA has been discarded (for more details on that, see Vink and Van Vliet 2009).

3.2 Sample Selection

Our base sample consists of all countries that were net oil exporters for at least one year between 1970 and 2008, the period for which reliable data is available. To exclude pure oil traders like Singapore, for instance, we also excluded all those countries with no proven reserves of mineral fuels using the PRIO Petrodata. Following Ross (2006), we further reduced our sample size, only keeping those countries with non-trivial amounts of oil production: that is, countries with more than 100 USD per capita in rents per year from exporting oil and gas in at least one year between 1970 and 2008. This two-step sample-selection procedure leaves us with 44 petroleum-producing countries (see Appendix 1).

3.3 Outcome (Dependent Variable): Civil War Onset

The dependent variable, or the outcome, is the onset of civil war, which is operationalized using UCDP/PRIO definitions and data (Gleditsch, Wallensteen, and Eriksson 2002). According to UCDP/PRIO, an armed conflict is a “contested incompatibility that concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths.” We define a civil war as any armed conflict that has caused at least 1,000 battle-related deaths in a given year. We positively coded *civilwaronset* for a country when at least one such conflict began or if an ongoing conflict or a new episode of a conflict caused 1,000 or more battle-related deaths over the course of one year. All other constellations, including those featuring armed conflicts with fewer than 1,000 victims, were coded as not experiencing civil war onset (see Appendix 2). On this basis, there are 30 cases in the sample that have not experienced civil war onset and 14 cases in which at least one civil war has broken out between 1970 and 2008.

3.4 Conditions (Independent Variables)

As demonstrated in the literature review, a multitude of possible factors exist that may indicate the three main mechanisms – motivation, opportunity, indirect effects – in the resource–conflict link. Because we want to provide the most parsimonious explanation – and given that QCA works better with fewer conditions⁶ – we engaged in extensive pre-testing and model calibration. This exercise resulted in the identification of four pertinent conditions, which will be presented and explained subsequently, including further calibration (e.g. thresholds). Reducing our explanatory model to four conditions does not mean, however, that we have completely limited our analysis to them. In Section 5 we will also discuss and report some findings from alternative model specifications, including additional conditions.⁷

⁶ Given a finite number of empirical cases, raising the number of conditions increases the quantity of logical remainders, which will in the end lead to less parsimonious solutions. See also the discussion in Section 5.

⁷ Additional conditions we have pre-tested include the lootability of oil production (onshore vs. offshore) and particularly non-resource-specific variables that have been found to matter in the resource–conflict link, such as population size, anocracy, outside protection, and GDP per capita. We present results on model specifi-

High(er) dependence on oil, as discussed above, indicates that oil is the main source of wealth in a country, which may have a number of harmful consequences that may indirectly increase the risk of civil war (indirect mechanism(s)): such dependence makes countries vulnerable to price shocks in the world oil market, fosters a rent-seeking mentality and results in weaker institutions and governance. Finally, in an economy dependent on oil, it is also more likely that economic conflict will center on this very commodity. Dependence on oil is the most conventional measure of resources in the resource–conflict literature and has been employed in many quantitative studies (cf. for an overview Dixon 2009). We measure dependence on oil using the ratio of available fuel exports to GDP. To minimize endogeneity problems, we use the mean between 1970 and the year before the possible civil war onset. If no civil war begins, the mean for the whole period of investigation is calculated. Because csQCA requires binary-coded conditions, we had to select a cut-off point. Looking at the actual distribution of the values in the sample, we see that 0.15 (indicating that 15 percent of the GDP consists of fuel exports) emerges as a sort of natural threshold range because no country shows this value or similar values (see Web Appendix 2). All values below this point have been coded as 0 and all values equal to and above as 1 (*dependence*).

Abundance: Contrary to dependence, oil abundance indicates what oil rents are available per capita. The per capita measure allows us to proxy the capacity of governments to employ peace-buying rentier mechanisms, thus testing possible motivation mechanisms and providing a proxy for state capacity that also impacts the feasibility of or opportunity for rebellion. Large-scale distributional policies and an effective security apparatus are extremely expensive, and income must be considered in relation to population size. We measure abundance in oil and gas as the average of oil and gas rents per capita between 1970 and the onset of civil war (or, if no war occurs, until 2008). Data on estimated income from these rents come from the World Bank Data on adjusted net savings (see Web Appendix 1). For abundance, we were able to identify a pertinent threshold. Condition pre-testing identified a cut-off point of 440 USD per capita from rents, above which no civil war began (see Web Appendix 3). Similar to *dependence*, all values below this point have been coded as 0 and all values equal to and above as 1 (*abundance*).

Overlap: While *abundance* captures motivation and opportunity mechanisms at the national level, our next condition is designed to indicate motive and opportunity for civil war at the sub-national level. Secessionist conflicts like those in Nigeria (Biafra, Niger Delta) or Indonesia (Aceh) illustrate that the interaction of ethnic or regional heterogeneity and oil reserves might be a particularly dangerous combination. The combination of resources and a shared group identity facilitates mobilization and provides a significant motive for uprising. This risk might increase if groups are already politically or otherwise aggrieved. Furthermore, resources may contribute to ethnic insurgency by supplying the necessary financial

cations including a selection of most important model specifications, including alternative conditions in Web Appendix 9.

means for armed rebellions. Our third variable therefore captures whether oil reserves are located in areas where ethnic groups that are excluded from the central political framework in a given country settle. To measure this overlap, we used PRIO data on the location of oil reserves (Lujala, Gleditsch, and Gilmore 2005) and matched them to geo-referenced data from the Ethnic Power Relations Data (see Wucherpfennig et al. 2010). We positively coded for overlap of ethnic exclusion and resource endowment (*overlap*) when overlap between the settlement of an excluded group and oil location could be identified within the period of investigation or, in the case of civil war onset, before the outbreak of civil war. If the area in which the excluded group was settled covered the entire state territory, we did not code this as an overlap. All other constellations were also rated 0.⁸

Type of political regime: The fourth variable in our model captures a non-resource-specific variable that describes the degree of legitimacy by the political regime. The debate on the link between democracy and civil war has found that hybrid regimes are most conflict prone (Hegre et al. 2001), though this result has been contested recently (Vreeland 2008). We do not suggest that democracy in itself represents one particular mechanism discussed above but we argue that democracy might have a conditioning effect on whether or not governments are able to deal with oil-related risks. In particular, democratic countries arguably find more legitimate and effective ways to tackle grievances. As a result, we expect that authoritarian countries, *ceteris paribus*, will cope less successfully with oil-related problems. Using the commonly used data source Polity IV, we fix the threshold between more or less democratic countries by calculating the mean of combined values between 1970 and 2008 or between 1970 and the onset of civil war (if applicable).⁹ All countries that score higher than “10” on a transformed and combined democracy/autocracy scale are considered relatively democratic.¹⁰

3.5 Model and Expectations

The four variables, *abundance*, *dependence*, *overlap* and *polity*, form a specific risk profile. According to our theoretical assumptions, the greatest risk of civil war should be found in countries that

- a) experience low oil abundance,
- b) are highly dependent on oil,

⁸ Because this procedure required subjective visual assessment, we performed inter-subjective coding via a group of three independently working coders.

⁹ See Web Appendix 1.

¹⁰ It is interesting to note that *anocracy*, the most conflict-prone regime type according to previous quantitative research, has been excluded from the core model in our pre-testing due to a relatively bad model fit. More details on this procedure are explained in Section 5. We report results of alternative model specifications in Web Appendix 9.

- c) feature a geographical overlap between oil reserves and excluded ethnic groups and
- d) are rather authoritarian.

In contrast, we should expect that countries that

- a) enjoy a great abundance of rents,
- b) are not dependent on oil,
- c) do not have a geographical overlap between excluded ethnic groups and oil reserves and
- d) possess a democratic polity will not experience civil war.

Consequently, we use the following model (1) to test for necessary and sufficient conditions of civil war onset and peace.

$$(1) \quad \text{civilwaronset} = f(\text{abundance, dependence, overlap, polity})$$

4 Empirical Analysis

4.1 The Truth Table

Table 1 below shows the truth table based on Model 1 for our sample. There are 16 possible configurations combining four binominal conditions ($2^4 = 16$) of which only four are not covered by empirical cases (= logical remainders).

Another 4 of the 16 possible configurations – which together represent 13 cases – have led to civil war onset. Row 1 shows one configuration with six countries (Algeria, Angola, Azerbaijan, Congo, Iran, and Nigeria). A second configuration represents civil war onsets in Indonesia, Iraq, Peru, Sudan, and Syria. Russia (row 3) and Yemen (row 4) are each part of another, different configuration. As highlighted in Table 1, all four configurations represent high-risk profiles. Furthermore, there are seven different configurations including 25 cases in which no civil war broke out between 1970 and 2008.

There is one configuration (row 8) that includes six cases with a contradictory outcome (C).¹¹ This configuration represents a medium risk profile and includes those (mostly Latin American) countries with low abundance, a low degree of dependence, a geographical overlap of oil reserves and a politically excluded ethnic group, as well as a relatively democratic polity. While in Argentina, Bolivia, Ecuador, Malaysia, and Mexico no civil war broke out between 1970 and 2008, Colombia experienced civil war onset during the period under study. Because of its contradicting outcomes, this configuration has to first be excluded from the test for sufficiency (Rihoux and De Meure 2009). We will discuss the relevance of this configuration in Section 5 of this paper and also show what it means for our results if this configuration is assumed to either lead to civil war onset or not.

¹¹ Please note that this configuration represents less than 14% of cases. In turn, this means that our model explains more than 84% of the cases in the sample.

Table 1: Truth Table: civilwaronset = f (abundance, dependence, overlap, polity)

Row No	Cases	No of cases	abundance	dependence	overlap	polity	civilwar-onset	consistency of civilwar-onset=1
1	Algeria, Angola, Azerbaijan, Congo, Iran, Nigeria	6	0	1	1	0	1	1.00
2	Indonesia, Iraq, Peru, Sudan, Syria	5	0	0	1	0	1	1.00
3	Russia	1	0	1	1	1	1	0.00
4	Yemen	1	0	1	0	0	1	1.00
5	Gabon, Kazakhstan, Kuwait, Saudi Arabia	4	1	1	1	0	0	0.00
6	Bahrain, Brunei, Libya, Oman, Qatar, Turkmenistan, United Arab Emirates	7	1	1	0	0	0	0.00
7	Cameroon, Côte d'Ivoire, Egypt, Tunisia, Vietnam	5	0	0	0	0	0	0.00
8	Argentina (0), Bolivia (0), Colombia (1), Ecuador (0), Malaysia (0), Mexico (0)	6	0	0	1	1	C	0.16
9	Australia, Denmark, Netherlands, Papua New Guinea, UK	5	0	0	0	1	0	0.00
10	Trinidad and Tobago, Venezuela	2	1	1	0	1	0	0.00
11	Canada	1	1	0	1	1	0	0.00
12	Norway	1	1	0	0	1	0	0.00
13	-	0	0	1	0	1	-	-
14	-	0	1	1	1	1	-	-
15	-	0	1	0	1	0	-	-
16	-	0	1	0	0	0	-	-

Please note: We have highlighted high risk conditions in this table. For instance, row 1 has 4 highlighted cells – this is a configuration with the highest risk of civil war onset. In contrast to that, in row 12 none of the cells is highlighted – this is a configuration with the lowest risk of civil war onset.

C indicates that a contradictory outcome exists for this configuration. The numbers in brackets after the countries in this row indicate the corresponding outcome

4.2 Identifying Necessary Conditions of Civil War Onset and Peace¹²

A condition is defined as necessary if it must be present for a certain outcome to occur (Ragin 1987: 99). Thus, tests for necessity attempt to verify whether a condition is always present if a certain outcome occurs.¹³

Table 2: Results for Necessary Conditions of CIVILWARONSET

Conditions tested:	Consistency	Coverage
ABUNDANCE	0.000000	0.000000
abundance	1.000000	0.482759
DEPENDENCE	0.571429	0.380952
dependence	0.428571	0.260870
OVERLAP	0.928571	0.565217
overlap	0.071429	0.047619
POLITY	0.142857	0.125000
polity	0.857143	0.428571

There is a single necessary condition of civil war onset, as shown by the consistency level of 1.000000 in Table 2.¹⁴ All countries that have experienced a civil war onset feature rents per capita below 440 USD (abundance). Additionally, spatial overlap between the settlement of politically excluded groups and oil reserves (OVERLAP) only marginally fails the test for necessity. It is interesting to note that this is only due to the case of Yemen. If *overlap* for Yemen had been coded 1, the consistency level¹⁵ of OVERLAP would be 1.000000 instead of 0.928571.

The coverage¹⁶ of low abundance as the necessary condition of civil war onset lies at 0.482759. This means that 48.3% of the cases that exhibit rents per capita below 440 USD experienced civil war onset.

¹² Please note that unlike in the case of the tests for sufficiency, the cases that are part of the configuration with contradicting outcomes in the truth table (row 8 in Table 1) will be included in the tests for necessity.

¹³ For the tests measuring necessity, we have used the software fs/QCA 2.5, which can be downloaded at <<http://www.u.arizona.edu/~cragin/fsQCA/software.shtml>> (July 18, 2010).

¹⁴ Uppercase letters represent the "1" value for a given binary condition or outcome, whereas lowercase letters represent the "0" value for that binary condition or outcome. This means that, for instance, "ABUNDANCE" represents all cases coded 1 that have an average rent per capita above 440 USD, whereas "abundance" represents all cases coded 0 that have an average rent per capita below 440 USD.

¹⁵ The consistency value of a necessary condition indicates the degree to which this condition overlaps with a particular outcome relative to all cases with the same outcome. If a given condition is present in all cases with the same outcome, the consistency value will be 1.000000, indicating that this is a necessary condition.

¹⁶ Coverage of a necessary condition measures the proportion of instances in which the condition arises that is necessarily explained by the outcome.

Table 3: Results for Necessary Conditions of civilwaronset

Conditions tested:	Consistency	Coverage
ABUNDANCE	0.500000	1.000000
abundance	0.500000	0.517241
DEPENDENCE	0.433333	0.619048
dependence	0.566667	0.739130
OVERLAP	0.333333	0.434783
overlap	0.666667	0.952381
POLITY	0.466667	0.875000
polity	0.533333	0.571429

Unlike in necessity tests for civil war onset, there is no necessary condition of peace (or the absence of civil war), as indicated by the presence of consistency values below 1.000000 in Table 3 for the eight different values of the four binominal conditions tested in our model.

Taken together – on a more technical level – the solution formula for the necessary conditions for civil war onset reads as follows:

$$\text{abundance} \leftarrow \text{CIVILWARONSET}$$

This formula means that an average level of per capita rents below 440 USD – a range pointing to what we define as a low degree of abundance – is a necessary condition of civil war onset among net oil-exporting countries between 1970 and 2008.

4.3 Identifying Sufficient and INUS Conditions of Civil War Onset and Peace

Tests for sufficiency attempt to verify whether a single condition always leads to the same outcome. In addition, INUS conditions are insufficient in themselves but necessary parts of a condition that is itself unnecessary to but sufficient for the outcome to occur (Ragin 2008: 154).

Boolean minimization¹⁷ is used in csQCA to test for sufficient conditions to produce a certain outcome and to seek the most parsimonious solution formulas including INUS conditions.¹⁸ This Boolean operation, however, presupposes that each possible logical configuration is covered by at least one real-world case. Logical remainders, as logically possible configurations that are *not* represented through empirical cases in the dataset, constrain this quest for parsimony.¹⁹ In the next two sections, we therefore present for each value of the dependent variable two results of Boolean minimization: one without using logical remainders and the second including logical remainders. We call the latter the *parsimonious solution* and the former the *complex solution*.

¹⁷ Boolean algebra was developed in the mid-19th century by the mathematician and logician George Boole and is based on logical rather than numeric characters. For a detailed introduction to this technique as used in QCA, see Ragin 1987, 85-102; Rihoux and De Meure 2009.

¹⁸ For the following tests of sufficiency, the software TOSMANA 1.3.1.0 has been used. See <<http://www.tosmana.net>> (July 13, 2010) for more information.

¹⁹ There are four logical remainders in our truth table (rows 13, 14, 15 and 16 in Table 1).

4.3.1 *Civil War Onset (CIVILWARONSET)*

A csQCA test for sufficiency using the outcome of civil war onset (CIVILWARONSET) excluding logical remainders yields the following complex solution:

$$\begin{aligned}
 & (2) \\
 & \text{abundance*polity*OVERLAP} + \\
 & \text{abundance*DEPENDENCE*OVERLAP} + \text{abundance*DEPENDENCE*polity} \\
 & \rightarrow \text{CIVILWARONSET} \\
 & \text{solution coverage: } 0.928571^{20} \\
 & \text{solution consistency: } 1.000000^{21}
 \end{aligned}$$

This solution (3) points to three distinct pathways that have led to civil war among net oil-exporting countries. Each of these pathways relates to a different group of countries; however, countries in configuration 1 of the truth table (Table 1) are explained by all three pathways.²²

To find a more parsimonious solution, logical remainders are included in the test for sufficiency. Formula (4) reports the most parsimonious solution that we could find using our sample of 44 oil-exporting countries:

$$\begin{aligned}
 & (3) \\
 & \text{abundance*DEPENDENCE} + \\
 & \text{abundance*polity*OVERLAP} \\
 & \rightarrow \text{CIVILWARONSET} \\
 & \text{solution coverage: } 0.928571 \\
 & \text{solution consistency: } 1.000000
 \end{aligned}$$

This parsimonious solution reveals that there are (only) two distinct pathways that lead to civil war onset.²³ First, low abundance and high dependence are together a sufficient explanation of civil war onset among oil-exporting nations. Second, low rent income from oil in authoritarian regimes featuring a spatial overlap between the settlements of politically excluded groups and oil reserves is also always associated with civil war onset. Taken separately, all four conditions in the model are relevant to some degree in explaining the onset of civil war. They form INUS conditions as part of these two sufficient explanations. While

²⁰ The coverage of a sufficient condition indicates the proportion of the outcomes that are explained by this condition.

²¹ The consistency of a sufficient condition measures the proportion of instances of this condition – coded as either 1 or 0 in csQCA – that overlap with the given value of the outcome – also coded as either 1 or 0 – in relation to the total number of cases with the same value for this condition. The higher the consistency level of a condition, the closer it is to being a consistently sufficient condition of the outcome.

²² Appendix 5 provides a more detailed overview on coverage of these three pathways.

²³ Please note that there is an alternative solution formula to the solution we present in formula (4) above. We report this alternative formula (Alternative 2) in Web Appendix 7. We prefer the version presented above (Alternative 1) over Alternative 2 because the latter assumes two logical remainders (configurations 13 and 15 in Table 1) leading to civil war instead of just one (configuration 13 in Table 1).

the combination of low abundance and high dependence explains over 57 percent, the combination of low abundance, autocracy and an overlap explains almost 79 percent of all civil war cases.²⁴

4.3.2 No Onset of Civil War (*civilwaronset*)

After having tested for sufficient conditions of civil war onset, formula (4) summarizes the results of the csQCA test for sufficiency using no civil war onset (peace) as an outcome. Similar to the tests in the previous section, we first present the complex solution and then the parsimonious solution.

A csQCA test for sufficiency using the absence of civil war (*civilwaronset*) as an outcome yields the following complex result:

$$\begin{aligned}
 & (4) \\
 & \text{ABUNDANCE*DEPENDENCE*polity +} \\
 & \quad \text{abundance*dependence*overlap +} \\
 & \text{ABUNDANCE*DEPENDENCE*overlap +} \\
 & \quad \text{ABUNDANCE*overlap*POLITY +} \\
 & \text{ABUNDANCE*dependence*POLITY} \\
 & \quad \rightarrow \text{civilwaronset} \\
 & \quad \text{solution coverage: 0.833333} \\
 & \quad \text{solution consistency: 1.000000}
 \end{aligned}$$

As indicated by this solution formula, there are five different (causal) pathways to peace in net oil-exporting countries. All five pathways are combinations of at least three out of the four different conditions in our model. Each pathway sufficiently explains the absence of civil war for a varying number of cases. While there are a number of cases explained by overlapping causal pathways, formula (4) provides at least one combination of INUS condition for each of the net oil-exporting countries, which did not experience civil war. The coverage of each of these four different sufficient explanations is reported in Table 4.²⁵

²⁴ It is important to note that this parsimonious explanation of civil war onset is the result of a computer-based simulation in regard to logical remainders. This algorithm systematically compares different solutions of Boolean minimization given the assumption that the existing logical remainders would lead to different outcomes and also given that the solution formula is most parsimonious. The solution presented above holds true only if one assumes that configuration 13 in Table 1 (*abundance*DEPENDENCE*overlap*DEMOCRACY*), which is one of four logical remainders in our truth table, is also associated with the onset of civil war.

²⁵ See Web Appendix 7 at the end of this paper for more details.

Table 4: Coverage of Solution Formulas for civilwaronset Excluding Logical Remainders

	ABUNDANCE* DEPENDENCE* polity	abundance* dependence* overlap	ABUNDANCE* dependence* POLITY	ABUNDANCE* DEPENDENCE* overlap	ABUNDANCE* overlap* POLITY
No. of countries explained	11	10	2	9	3
Raw coverage	0.366667	0.333333	0.066667	0.300000	0.100000
Unique coverage	0.133333	0.333333	0.033333	0.000000	0.000000

Boolean minimization involving the four logical remainders²⁶ reveals the following parsimonious solution:

$$(5)$$

$$\text{ABUNDANCE} +$$

$$\text{dependence*overlap}$$

$$\rightarrow \text{civilwaronset}$$

solution coverage: 0.833333
solution consistency: 1.000000

This solution formula points to two distinct pathways of peace. However, the solution rests on the assumption that three of the previously mentioned logical remainders – rows 14, 15 and 16 of the truth table in Table 1 – lead to the absence of civil war onset.

Table 5: Coverage of Solution Formula for the Absence of Civil War Including Logical Remainders

	ABUNDANCE	dependence*overlap
Assumption Regarding Logical Remainders: Configuration 14, 15, and 16 in Table 1 lead to no civil war onset		
No. of countries explained	15	11
Raw coverage	0.500000	0.366667
Unique coverage	0.466667	0.333333

Like the complex solution, the parsimonious solution (5) shows that there is more than a single combination of conditions that sufficiently explain the absence of civil war onset. One pathway is explained by a single sufficient condition, which mirrors the necessary condition for civil war identified above: high rents per capita (ABUNDANCE). The second pathway consists of a combination of low dependence (dependence) with no overlap between politi-

²⁶ For logical remainders, see rows 13, 14, 15 and 16 in the truth table (Table 1).

cally marginalized groups and oil location (overlap). The coverage of each of the two different sufficient explanations is reported in Table 5. While each pathway sufficiently explains the absence of civil war for different numbers of cases, only Norway is explained by both pathways (see Web Appendix 8). Formula (5) therefore reports two almost mutually exclusive explanations of peace among net oil-exporting countries.

5 Discussion of Model Specifications

Two remarks on alternative specifications in our QCA model are in order. The first concerns the inclusion of contradictory configurations, whereas the second relates to the inclusion of alternative conditions that might provide alternative explanations for the outcome.

- 1) First, what happens to our results if contradictions – such as, for instance, row 8 in Table 1 – are included in a test for sufficiency?²⁷ Strictly speaking, we must note that our core model explains 13 out of 14 cases with civil war onset (coverage of 93 percent) and 25 out of 30 with peace (coverage of 83 percent). Six cases in row 8 of our truth table (Table 1) feature a configuration that is connected with contradictory outcomes. Five of them have experienced no onset of civil war (Argentina, Bolivia, Ecuador, Malaysia, and Mexico), but in one case (Colombia) a civil war broke out between 1970 and 2008. One solution to the problem of contradictions is to hypothesize that this specific configuration will lead to either civil war or peace. A repetition of sufficiency tests under such assumptions will provide us with estimations on how confident we can be about our main findings.

We have done a number of additional tests assuming that configuration number 8 in Table 1 will either completely avoid the onset of civil war or entirely consists of countries with at least one civil war onset in the period under study. Since the latter assumption seems to be much more unrealistic than the former, we will concentrate on discussing the relevance of the former assumption only. Hypothetically recoding the case of Colombia as having not experienced civil war does not lead to major changes in our configurational pathways explaining the onset of civil war as presented in solution formulas 2 and 3.²⁸ However, it does affect results explaining peace among net oil-exporting countries. While main elements of the results presented above remain the same, a third pathway needs to be added to formula 5. This hypothesized new pathway consists of a combination of low dependence (dependence) and democracy (POLITY) explaining – among others – all countries that are part of row 8 in Table 1. It is important to note that all other existing solutions remain stable. Taken together, this supplementary perspective further strengthens confidence in our primary results.

²⁷ Please note that discussing the relevance of contradicting configurations relates only to tests of sufficiency. Since tests of necessity are technically executed with only cases and not with configurations, our previous findings relating to the necessary conditions of civil war onset and peace (solution formula 2) holds true for all cases in our sample, also including those six cases in row 8 of Table 1.

²⁸ To be more precise, the only changes taking place relate to coefficients of coverage. Coverage changes to a value of 1.00000, pointing to an explanation of all cases in the sample.

- 2) Second, one contradicting configuration may indicate that the model we have used is under-specified and we need to include further possible conditions or other specifications. On a technical level, increasing the number of variables in csQCA models does not come without costs. Based on the analytical logic of QCA, there is a trade-off between the number of conditions included in the model and the number of potential logical remainders given the constant number of historical cases. The more binary-coded conditions, the exponentially higher the number of theoretically possible configurations. Given the usually static number of historical cases, it is imperative then that the number of logical remainders – configurations not represented by empirical cases – increases as well. This complicates the interpretation of results and increases the need to use more simplifying assumptions in order to identify most parsimonious solutions.²⁹ Therefore we believe that in the process of QCA model calibration there is a trade off between the number of contradicting cases on the one hand and the number of logical remainders on the other hand. Hence, we believe that the most parsimonious model consists of the lowest sum of both numbers. The aggregate of the number of contradiction cases and the number of logical remainders is something we would call a measure of model fit.

In order to check for some sort of model robustness, we performed a number of alternative model specifications including additional conditions – in particular *lootability*, *anocracy*, *population size*, *GDP p.c.* and *outside protection*. It turned out that our preferred model has the best model fit available given the nine different conditions, and that it also explains the largest number of cases in our sample compared to all other model specifications. Therefore we believe that our main model as presented in this paper provides the most parsimonious solution given a number of alternative conditions and specifications.³⁰

One contradicting configuration including one outlier (Colombia) does not represent a substantial limitation of our results. However, this finding calls for future research. One observation is that all countries that belong to this configuration have indeed experienced minor civil war (below the threshold of 1,000 battle-related deaths). It is possible that this configuration is prone to this kind of violence. Moreover, this configuration includes low dependence as one of its conditions, which may suggest that oil is less important for these economies on the whole and thus that non-oil-specific conditions play a bigger role. In fact, in Colombia, the conflict between government forces and leftist guerrillas is, if anything, connected to narcotics rather than oil (Ross 2004b). Methodologically, these and related hypotheses could be tested by using either additional QCA analyses or qualitative controlled comparison, such as by comparing the outlier Colombia to all or some of the other, peaceful cases of this configuration.

²⁹ A high number of logical remainders, however, limits the opportunities for Boolean minimization and increases the need to use more simplifying assumptions to identify the most parsimonious solution.

³⁰ For instance, a model including *abundance*, *dependence*, *overlap* and *anocracy* leads to 11 cases in contradicting configurations including four logical remainders. We have attached an overview of results on model specifications including alternative conditions in Web Appendix 9.

6 Conclusion

This paper provides a fresh perspective on the structural origins of civil war and peace among net oil-exporting countries. By using crisp-set QCA we have found a convincing configurational explanation as to why some oil-exporting countries have experienced civil war and others have not. This solution remains stable in relation to a number of model specifications.

Moreover, we believe that our findings substantially advance the debate on natural resources and civil war. Our results reveal that there is no simple (linear) relationship and not one single mechanism that links oil to civil war. It is not oil as such, or a single operationalization, but the combination of oil-related characteristics in a country with particular non-oil conditions:

First, we found that low abundance is a necessary condition of civil war onset. All cases of civil war among oil-exporting countries between 1970 and 2008 did experience a comparatively low degree of rents per capita. We have also isolated high dependence and low abundance as INUS conditions of civil war onset explaining sufficiently over 50 percent of the relevant cases, indicating a particularly risky combination, as previously suggested by Basedau and Lay (2009). However, we have also found a second pathway leading to civil war within net oil-exporting countries that connects the properties of oil to the political regime and interethnic relations: authoritarian oil regimes suffer from civil war only if combined with low oil abundance and if politically excluded groups settle in oil-reserve territories. Unsurprisingly, many of the countries showing this configuration (such as Indonesia, Nigeria, and Sudan) have experienced secessionist conflicts. Taken together, both pathways are able to explain 13 out of 14 cases with civil war onset between 1970 and 2008.

Unlike most of the quantitative literature on civil war, we are also able to specify causal explanations leading to peace, defined as the non-occurrence of civil war. Interestingly, we have found no necessary conditions for peace. We interpret this as evidence supporting the assumption that there are many more configurations that will lead to peace than configurations that will lead to civil war onset. Apparently, peace is still the most likely status, even for petroleum-rich countries, and this is true for a variety of reasons.

We have found two major pathways that sufficiently explain the non-occurrence of civil war. High rents per capita are the most wide-ranging single condition in this context. Out of 30 cases, 15 are sufficiently explained by this condition among net oil-exporting countries in our sample. Low dependence and the lack of overlap between politically excluded groups and oil-reserve areas are two alternative INUS conditions that are jointly sufficient to prevent the onset of civil war. Apparently, the type of political regime is not as important for peace as it is for civil war.

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Appendix

Appendix 1 – Sample

Algeria	Egypt, Arab Rep.	Peru
Angola	Gabon	Qatar
Argentina	Indonesia	Russia
Australia	Iran, Islamic Rep.	Saudi Arabia
Azerbaijan	Iraq	Sudan
Bahrain	Kazakhstan	Syria
Bolivia	Kuwait	Trinidad and Tobago
Brunei Darussalam	Libya	Tunisia
Cameroon	Malaysia	Turkmenistan
Canada	Mexico	United Arab Emirates
Colombia	Netherlands	United Kingdom
Congo, Rep.	Nigeria	Venezuela, RB
Cote d'Ivoire	Norway	Vietnam
Denmark	Oman	Yemen, Rep.
Ecuador	Papua New Guinea	

Selection criteria: All countries between 1970–2008 with at least one single year of net exports of mineral fuels (SITC Rev1 3),³¹ proven reserves of mineral fuels (crude oil and natural gas) according to PRIO Petrodata (V1.2.), and at least 100 USD per capita rents from production of mineral fuels for at least one year.³²

³¹ Data are from UN comtrade (SITC Rev. 1,33), online: <<http://comtrade.un.org/db/default.aspx>>, (June 6, 2010).

³² Data are from World Bank/Adjusted Net Saving Data Center: Oil and gas rents, online: <http://siteresources.worldbank.org/INTEEI/1105643-1115814965717/21683431/oil_and_gas_rents.xls>, (May 11, 2010).

Web Appendix

Web Appendix 1 – Codebook

	Coding rules	Description	Sources
<i>civilwaronset</i>	1: if at least 1,000 battle-related deaths in a given year for the first time between 1970 and 2008 (new civil war onset, or new episode of civil war or ongoing conflict) 0: all other constellations		UCDP/PRIO Armed Conflict Dataset v.4-2009, 1946 – 2008, online: http://www.pcr.uu.se/research/UCDP/data_and_publications/datasets.htm (April 20, 2010).
<i>abundance</i>	1: value of mean oil and gas rents per capita equal and above \$440 0: value mean oil and gas rents per capita below \$440	Mean of available oil and gas rents in US\$ per capita between 1970 and the year before <i>civilwaronset</i> = 1; otherwise, mean over the whole period (1970–2008) ³³	World Bank/Adjusted Net Saving Data Center: Oil and gas rents, online: http://siteresources.worldbank.org/INTEEI/1105643-1115814965717/21683431/oil_and_gas_rents.xls (November 5, 2008). World Bank: World Development Indicators online (April 20, 2010).
<i>dependence</i> ³⁴	1: value of mean of the ratio of available fuel exports to GDP equal and above 0.15 0: value of mean of the ratio of available fuel exports below 0.15	Mean of the ratio of available fuel exports to GDP, 1970 and the year before <i>civilwaronset</i> = 1; otherwise, mean over the whole period (1970–2008)	World Bank/Adjusted Net Saving Data Center: Oil and gas rents, online: http://siteresources.worldbank.org/INTEEI/1105643-1115814965717/21683431/oil_and_gas_rents.xls (November 5, 2008). World Bank: World Development Indicators online (April 20, 2010).
<i>overlap</i> ³⁵	1: if settlement of excluded group(s) and resource locations overlap in general or in the case of civil war before the onset of civil war or the onset of the first new episode of an old civil war (overlap only if the settlements of the group do not cover the whole/very large parts of the country.) 0: all other constellations	Coded on the basis of separate maps by three different coders independently. EPR categories for excluded groups: powerless, discriminated, regional autonomy/secessionist autonomy	GeoEPR, online: http://dvn.iq.harvard.edu/dvn/dv/epr (April 21, 2010).

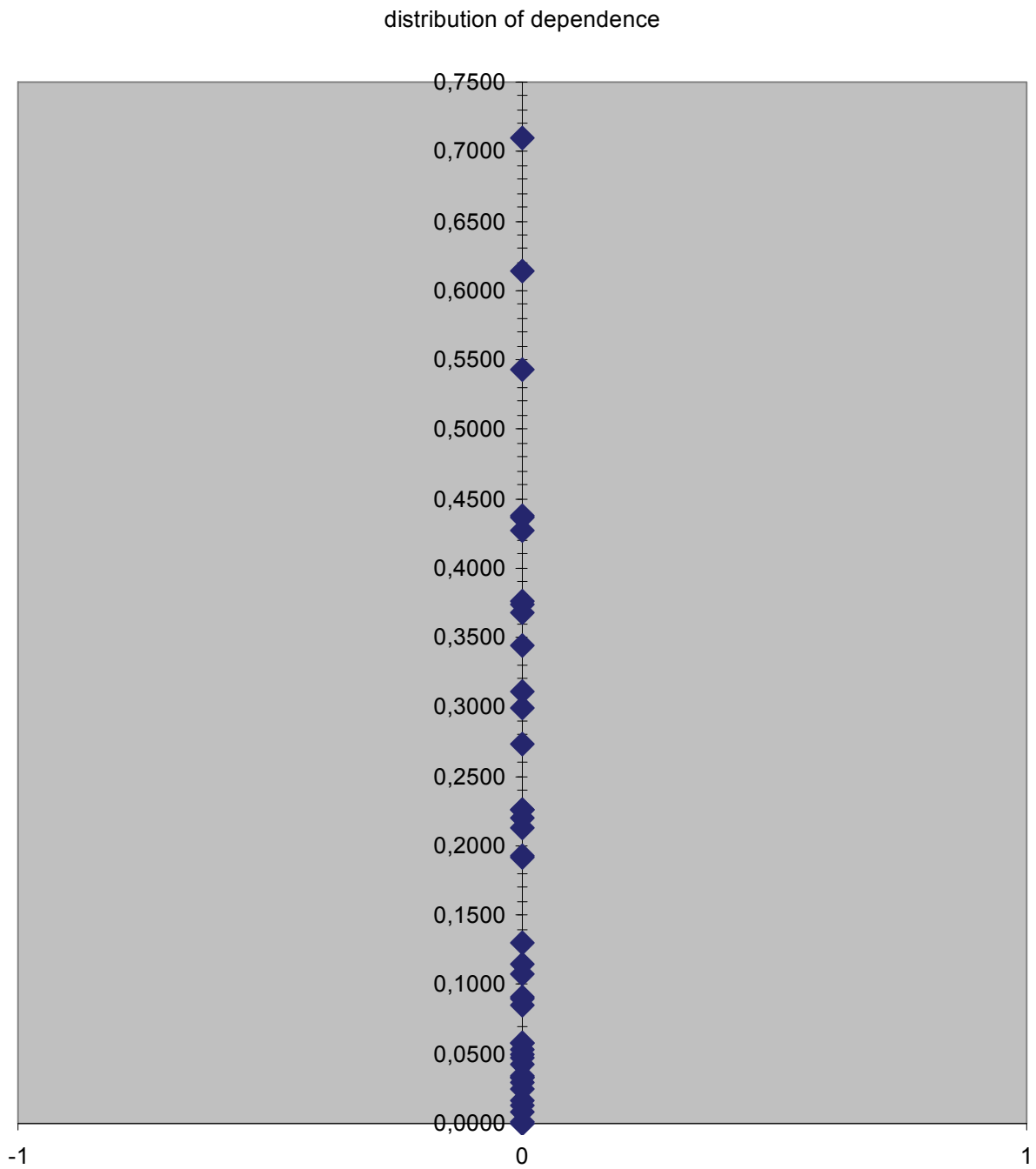
³³ Please note that in order to calculate *abundance* for Angola, we used the value of rents in 1975, which coincides with the onset of civil war as well as with the first year of Angola in the dataset (year of national independence).

³⁴ Due to the lack of data on oil and gas exports or the lack of GDP data, *dependence* has a number of missing values (Azerbaijan, Russia, Sudan, Yemen). However, due to our country expertise we estimated the values of *dependence* as follows: Azerbaijan = 1; Russia = 1; Sudan = 0; Yemen = 1.

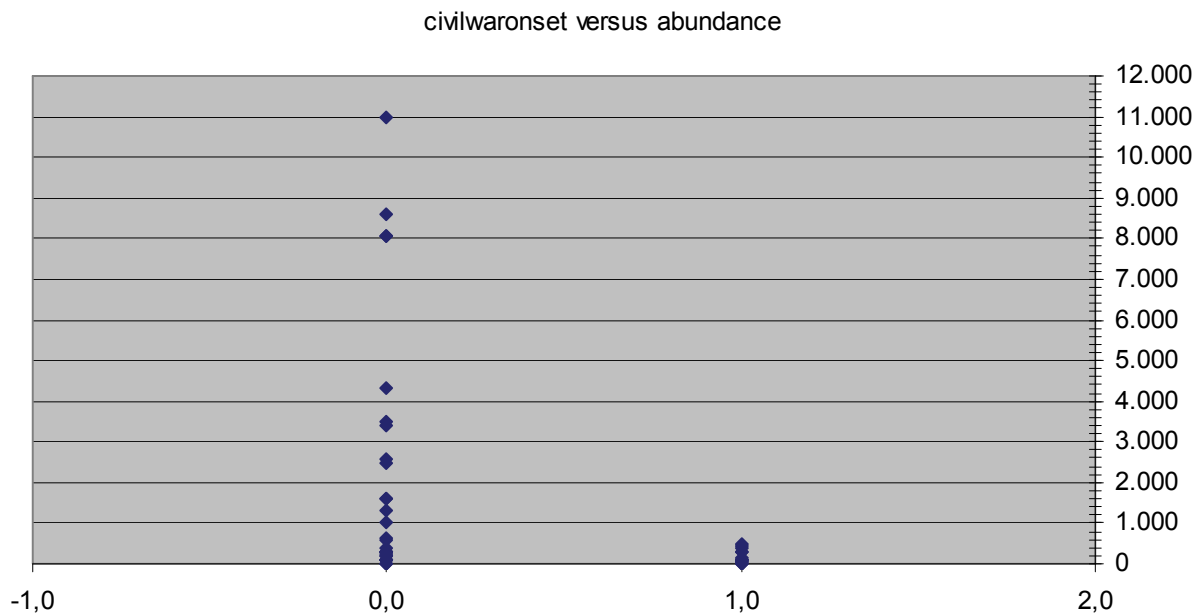
³⁵ Bahrain, Brunei and Qatar are not covered by EPR data. Therefore we decided to code all three cases as 0.

	Coding rules	Description	Sources
<i>polity</i>	1: mean value of the transformed Polity IV score above 10. 0: mean value of the transformed Polity IV score below 10.	Mean of the revised and combined Polity IV score (p_polity2) between 1970 and the year before <i>civilwaronset</i> = 1; otherwise, mean over the whole period (1970–2008); The original value of p_polity2 has been transformed to a 0 to 20 scale before means are calculated.	Teorell, Jan, Marcus Samanni, Nicholas Charron, Sören Holmberg and Bo Rothstein. 2010. The Quality of Government Dataset, version May 27, 2010. University of Gothenburg: The Quality of Government Institute, http://www.qog.pol.gu.se (November 10, 2010).
<i>lootability</i>	1: if reserves are on-shore (and offshore) 0: if reserves are only offshore		PRI/CSCW: Petroleum Dataset v. 1.2, online: http://www.prio.no/CSCW/Datasets/Geographical-and-Resource/Petroleum-Dataset/ (April 20, 2010).
<i>population size</i>	1: if more than 25 million inhabitants 0: if less than 25 million inhabitants		World Bank: World Development Indicators online (April 20, 2010)
<i>anocracy</i>	1: mean value of the transformed Polity IV score above between 5 and 15. 0: mean value of the transformed Polity IV score below 5 and above 15.	Mean of the revised and combined Polity IV score (p_polity2) between 1970 and the year before <i>civilwaronset</i> = 1; otherwise, mean over the whole period (1970–2008); The original value of p_polity2 has been transformed to a 0 to 20 scale before means are calculated.	Teorell, Jan, Marcus Samanni, Nicholas Charron, Sören Holmberg and Bo Rothstein. 2010. The Quality of Government Dataset, version May 27, 2010. University of Gothenburg: The Quality of Government Institute, http://www.qog.pol.gu.se (November 10, 2010)
<i>outside protection</i>	1: if a UNSC permanent member (China, France, Russia, U.K., U.S.) maintains a military base employed with regular combat forces in the country. 0: no bases	Existence of U.S., British, French, Russian or Chinese military base(s) in a country.	Own investigation using a variety of sources.
<i>GDP per capita</i>	1: mean value of per capita GDP above US\$ 2000. 0: mean value of per capita GDP below US\$ 2000		World Bank: World Development Indicators online (April 20, 2010).

Web Appendix 2 – Distribution of *dependence*



Web Appendix 3 – Distribution of *civilwaronset* versus *abundance*



Web Appendix 4 – Coverage of the Complex Solution for civil war onset Excluding Logical Remainders

	abundance*polity* OVERLAP	abundance* DEPENDENCE * OVERLAP	abundance*polity* DE- PENDENCE
No. of countries explained	11	7	7
Raw coverage	0.785714	0.500000	0.500000
Unique coverage	0.357143	0.071429	0.071429
Algeria	X	X	X
Angola	X	X	X
Azerbaijan	X	X	X
Colombia (C)			
Congo	X	X	X
Indonesia	X		
Iran	X	X	X
Iraq	X		
Nigeria	X	X	X
Peru	X		
Russia		X	
Sudan	X		
Syria	X		
Yemen			X

Please note: C denotes that cases belong to a configuration with a contradictory outcome even though they have experienced an onset of civil war. These cases are not explained by sufficient or INUS conditions.

**Web Appendix 5 – Parsimonious Solution for civil war onset Including Logical
Remainders (Alternative 1)**

	abundance* DEPENDENCE	abundance*polity* OVERLAP
Assumption Regarding Logical Remainders: Configuration 13 in Table 1 leads to civil war onset		
No. of countries explained	8	11
Raw coverage	0.571429	0.785714
Unique coverage	0.142857	0.357142
Algeria	X	X
Angola	X	X
Azerbaijan	X	X
Colombia (C)		
Congo	X	X
Indonesia		X
Iran	X	X
Iraq		X
Nigeria	X	X
Peru		X
Russia	X	
Sudan		X
Syria		X
Yemen	X	

Please note: C denotes that cases belong to a configuration with a contradictory outcome even though they have experienced an onset of civil war. These cases are not explained by sufficient or INUS conditions.

**Web Appendix 6 – Parsimonious Solution for civil war onset Including Logical
Remainders (Alternative 2)**

	abundance* DEPENDENCE	dependence*polity*OVERLAP
Assumption Regarding Logical Remainders: Configuration 13 as well as 15 in Table 1 lead to civil war onset		
No. of countries explained	8	4
Raw coverage	0.571429	0.357143
Unique coverage	0.142857	0.357143
Algeria	X	
Angola	X	
Azerbaijan	X	
Colombia (C)		
Congo	X	
Indonesia		X
Iran	X	
Iraq		X
Nigeria	X	
Peru		X
Russia	X	
Sudan		X
Syria		X
Yemen	X	

Please note: C denotes that cases belong to a configuration with a contradictory outcome even though they have experienced an onset of civil war. These cases are not explained by sufficient or INUS conditions.

**Web Appendix 7 – Coverage of the Complex Solution for no onset of civil war (Peace)
Excluding Logical Remainders³⁶**

	ABUNDANCE* DEPENDENCE* polity	abundance* dependence* overlap	ABUNDANCE* DEPENDENCE* overlap	ABUNDANCE* overlap* POLITY	ABUNDANCE* dependence* POLITY
No. of countries explained	11	10	9	3	2
Raw coverage	0.366667	0.333333	0.300000	0.100000	0.066667
Unique coverage	0.133333	0.333333	0.000000	0.000000	0.033333
Argentina (C)					
Australia		X			
Bahrain	X		X		
Bolivia (C)					
Brunei	X		X		
Cameroon		X			
Canada					X
Côte d'Ivoire		X			
Denmark		X			
Ecuador (C)					
Egypt		X			
Gabon	X				
Kazakhstan	X				
Kuwait	X				
Libya	X		X		
Malaysia (C)					
Mexico (C)					
Netherlands		X			
Norway				X	X
Oman	X		X		
Papua New Guinea		X			
Qatar	X		X		
Saudi Arabia	X				
Trinidad and Tobago			X	X	
Tunisia		X			
Turkmenistan	X		X		
United Arab Emirates	X		X		
United Kingdom		X			
Venezuela			X	X	
Vietnam		X			

Please note: C denotes that cases belong to a configuration with a contradictory outcome even though they have experienced no onset of civil war. These cases are not explained by sufficient or INUS conditions.

³⁶ A (C) indicates membership into a contradicting configuration, cf. also Table 1. These cases are not explained by sufficient or INUS conditions.

Web Appendix 8 – Coverage of the Parsimonious Solution for no onset of civil war Including Logical Remainders

	ABUNDANCE	dependence*overlap
Assumption Regarding Logical Remainders: Configuration 14, 15 and 16 in Table 1 lead to no civil war onset		
No. of countries explained	15	11
Raw coverage	0.500000	0.366667
Unique coverage	0.466667	0.333333
Argentina (C)		
Australia		X
Bahrain	X	
Bolivia (C)		
Brunei	X	
Cameroon		X
Canada	X	
Cote d'Ivoire		X
Denmark		X
Ecuador (C)		
Egypt		X
Gabon	X	
Kazakhstan	X	
Kuwait	X	
Libya	X	
Malaysia (C)		
Mexico (C)		
Netherlands		X
Norway	X	X
Oman	X	
Papua New Guinea		X
Qatar	X	
Saudi Arabia	X	
Trinidad and Tobago	X	
Tunisia		X
Turkmenistan	X	
United Arab Emirates	X	
United Kingdom		X
Venezuela	X	
Vietnam		X
Yemen		X

Please note: C denotes that cases belong to a configuration with a contradictory outcome even though they have experienced no onset of civil war. These cases are not explained by sufficient or INUS conditions.

Web Appendix 9 – Results of Model Specifications Including Alternative Conditions³⁷

Model no.	OUT-COME	CONDITIONS									CC (No. of contradicting cases)	LR (No. of local remainders)	Model fit (CC + LR)
	civil-war-onset	abundance	dependence	overlap	polity	lootability	pop25	gdppc 2000	outside-protection	anocracy			
1	x	x	x	x	x						6	4	10
2	x	x		x	x					x	7	3	10
3	x	x	x	x							11	0	11
4	x	x		x	x		x				8	4	12
5	x	x	x	x				x			9	3	12
6	x	x		x	x				x		10	2	12
7	x	x		x				x		x	9	6	15
8	x	x		x					x	x	9	6	15
9	x	x	x	x						x	11	4	15
10	x	x	x	x					x		10	6	16
11	x	x	x	x			x				11	5	16
12	x	x	x						x		14	2	16
13	x	x	x					x			15	1	16
14	x	x	x	x	x					x	2	15	17
15	x	x		x	x			x			13	4	17
16	x	x			x			x	x		15	2	17
17	x	x	x	x	x		x				3	15	18
18	x	x	x	x		x					11	7	18
19	x	x	x		x	x					11	7	18
20	x	x	x					x	x		12	6	18
21	x	x		x	x	x					12	6	18
22	x	x	x		x		x				14	4	18
23	x	x	x		x				x		14	4	18
24	x	x	x	x	x			x			4	16	20
25	x	x	x	x	x				x		5	15	20

³⁷ These are the first 25 most parsimonious models we have tested given all nine conditions we consider to be of importance in this context. Please note that Model 2 has the same model fit as Model 1. However, the latter has fewer contradicting cases than the former; therefore it has been selected as our preferred model in this paper. A complete set of results on different specifications is available upon request from the authors.

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