# Indirect Rivalries and Civil Wars: Empirical Evidence

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# Indirect Rivalries and Civil Wars: Empirical Evidence

Mahdi Fawaz and Erwan Le Quellec

BSE, University of Bordeaux, Bordeaux France

**ABSTRACT**

In this paper, we develop a new dataset on indirect state rivalry relations based on different matrix calculations for 154 countries, over the period 1970-2015, and demonstrate their importance in explaining civil wars. After controlling for spatial distances between rival countries, we demonstrate that 1) the presence of direct and indirect rivals exerts a positive and significant effect on the risk of civil war; 2) decreasing levels of military capacity of one state relative to its rivals (direct and indirect) also influence the probability of internal conflict. Finally, we confirm the significance of our indicators by using on the one hand the random forest algorithm, a machine learning method using decision trees and on the other hand, the Kaplan-Meier estimate for the duration of the civil wars.

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Your friends are three and your enemies are (also) three. Your friends are: your friend, your friend's friend and your enemy's enemy. And your enemies are: your enemy, your friend's enemy and your enemy's friend.

Amir al-mu'minin, Ali ibn Abi Taleb, 599-661

## Introduction

In recent years, there has been a growing body of research on the impact of direct state relations (rivalries and alliances) on the likelihood of civil war. While it is well accepted that the phenomenon of rivalries increases the risk of civil war in the countries concerned (Rooney 2018; Uzonyi 2018; Toukan 2019; Bak, Chávez, and River 2020; Fawaz 2021), there are conflicting results on the usefulness of allies (Boutton 2014; Sullivan and Karreth 2015). However, there is no empirical work analyzing the impact of indirect (or second-order) relationships on the risk of civil war. Understanding the role of indirect rivalries can help implement policies to contain or end violence. Our study distinguishes between two indirect rivals that can influence the risk of civil war for a focal state: 'allies of rivals' and 'rivals of allies'.

Interest in the role of the international context in explaining civil wars is recent. Seminal studies in conflict analysis have mainly focused on analyzing local country characteristics to understand conflict dynamics. However, a new branch of the literature has attempted to integrate a regional and global dimension to explain internal conflict dynamics. Related work shows the effect of international policies on internal political development. In particular, these studies argue that countries facing interstate rivalries are more likely to experience civil wars (Lee 2018; Uzonyi 2018; Toukan 2019; Bak, Chávez, and Rider 2020).

A vast literature has been devoted to the concept of interstate rivalries (Diehl and Goertz 2000; Vasquez 2004). While it is commonly accepted that two states are rivals (or potential rivals) when their behavior threatens the interests of the other. Pioneering empirical studies have analyzed rivalry

**CONTACT** Mahdi Fawaz mfawaz@u-bordeaux.fr BSE, University of Bordeaux, Bordeaux France

in terms of the intensity of interstate warfare based on a well-defined threshold of human casualties (Akcinaroglu and Radziszewski 2005). The problem with these works is that it does not capture the entire period of rivalry but only their most extreme manifestation (Goertz and Diehl 1993). Moreover, less intense interstate wars can be excluded from the analysis (Thompson 2001). By considering more complex forms of interstate tension (diplomatic tension or threat of force), some works have developed more complex measures of rivalry (Goertz, Diehl, and Balas 2016). Recent empirical studies associated with the analysis of civil wars generally consider these different forms of rivalry (Toukan 2019; Rooney 2018; Uzonyi 2018).

In contrast, indirect rivalry relationships are not taken into account. The omission of these relationships can lead to a simplification of complex interstate relations and bias the analysis. In particular, 'allies of rivals' and 'rivals of allies' are considered indirect rivals. In his *Art of War*, Sun Tzu ([1078] 2007, 141) already emphasized this aspect: 'Examine the question of [the enemy's] alliances and see to it that they are broken and dislocated. If an enemy has allies, the problem is severe and the enemy's position strong; if he has none, the problem is minor and his position weak' [text in square brackets added by the authors]. Indeed, alliances between states reflect strategic visions and common interests within an anarchic international system. Allies, therefore, develop a system of mutual support for defensive and offensive purposes to survive in a competitive international environment, as no state can ensure its security in the face of external threats (Wolfers 1962). In this sense, in the context of foreign interference, indirect rivals can also participate in the weakening of the focal state and the risk of civil war.

From this perspective, this article aims to study the role of direct and indirect rivalries, controlling for spatial distances between rival countries, on the occurrence of civil wars, in 154 countries, over the period 1970-2015. By combining several cross-sectional data sets, this study makes two main contributions. First, we construct an alternative measure of indirect rivalries that relies on *Social Networks Analysis* (SNA) approach and methodology (Wasseman and Faust 1994), in line with political scientists who use this approach to study international processes and phenomena (König et al. 2017). As a first step, we rely on the rivalry database of Goertz, Diehl, and Balas (2016) to define the direct (first order) rivalry network. We then use this information to derive direct friendship and indirect (second-order) rivalry relationships i.e 'allies of rivals' and 'rivals of allies'. Second, we construct a measure of the balance of power between countries and their rivals.

More precisely, we address two hypotheses on the role of direct and indirect rivalries in the occurrence of civil wars. First, the more direct and indirect rivals a country has, the more likely it will experience civil war. The second, the lower a country's military capacity relative (balance of power) to its direct and indirect rivals, the greater the risk of civil war. We will confirm our two hypotheses by a logit model. For the robustness of our results, we use the random forest algorithm, a particularly well-suited algorithm for predicting rare events such as civil wars, and a Kaplan-Meier estimate of the duration of civil wars.

The rest of the article is structured as follows. Section 2 presents the theoretical framework and the hypotheses. Section 3 details our empirical strategy for measuring direct and indirect rivalry measures. Section 4 presents our empirical methodology and the data used. Section 5 presents the main findings. In section 6, we test the robustness of our results. Finally, Section 7 concludes.

## Theory

Since the end of the Second World War, the decline of interstate wars has gone hand in hand with an increase in the number of civil wars. Various authors have suggested a causal link between these two trends. According to Salehyan, Gleditsch, and Cunningham (2011), this could be explained by the increasing involvement of foreign governments in supporting armed groups in rival countries. Indeed, there are several constraints to direct confrontation between states identified in the literature. Constraints on direct military intervention may be legal (Salehyan 2010), economic (Stiglitz and Bilmes 2008) or related to the risk of nuclear escalation (Mumford 2013). We note two mechanisms by which rivals attempt to weaken another state (see Figure 1).

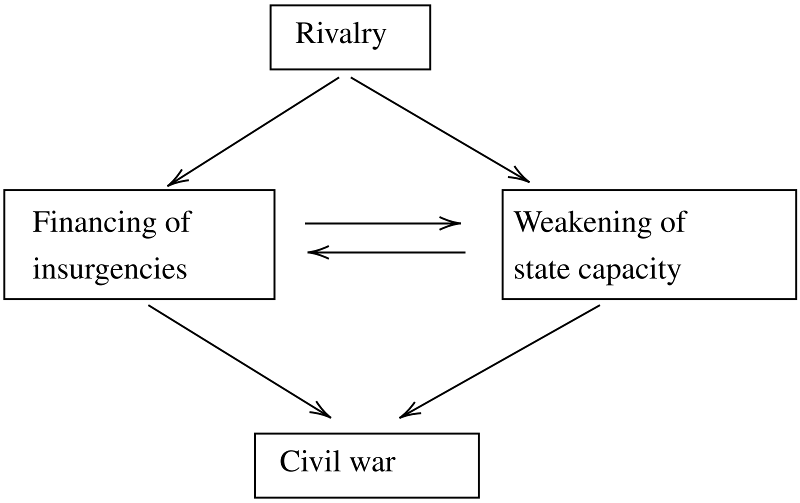


**Figure 1.** Rivalry and civil war: transmission channels.

The first is financing armed groups between rival countries or the 'subversion strategy' (Lee 2018). It is considered one of the main perverse effects of rivalries (Balch-lindsay, Enterline, and Joyce 2008).[1] This strategy has the advantage of circumventing legal constraints and limiting the costs of the conflict (Hawkins et al. 2006). Moreover, it disrupts the internal sovereignty of the target state, which can lead to large-scale violence (Salehyan, Gleditsch, and Cunningham 2011). However, this strategy does not always lead to violence. It sometimes manifests itself more insidiously, notably by competing with or replacing the administrative apparatus of the state; for example, by maintaining parallel local security or taxation institutions (Staniland 2012). The second strategy is coercive, with the hostile state issuing threats to degrade or defeat a state's internal sovereignty over part of its territory (Lee 2018). If the expected or actual benefits of administering a given area are lower than the expected costs of coercive threats to the target state, the latter will thus leave part of its territory wholly or partially ungoverned. These coercive threats against the target state can be military, although economic and/or diplomatic threats are preferred instruments (Jeong 2021).

While these strategies do not always result in the overthrow of the rival government, they can help weaken the enemy's state capacity. This weakening can reduce the opportunity cost of rebellion for agents, as their income from productive activities is reduced, and by extension, to the outbreak of civil war (Besley and Persson 2011). Indeed, in this situation, if the 'victim' state fails to 'buy off the opposition', i.e. to deter rebellion by improving the quality of institutions or by agreeing to distribute some resources to dissatisfied groups, it may engage in repression to deal with domestic dissidents (Silve and Verdier 2018; Uzonyi 2018). This phenomenon leads the government into a civil war (Lindemann and Wimmer 2018). Thus, rivalries change policymakers' choices at the international level and the local level.

In an anarchic international system, states are often seen as rational entities motivated only by survival (Wolfer 1962). They are therefore sovereign and differ only in their respective military capabilities. Since states are suspicious of each other, they see each other as potential threats: 'The international system is [. . .] a brutal arena where states look for opportunities to take advantage of each other, and [. . .] have little reason to trust each other' (Mearsheimer 1995, 9). Thus, states may enter into rivalry in the presence of conflicting interests in the appropriation of a resource (territory or oil) or hegemonic struggles. This rivalry can take the form of economic and diplomatic sanctions or, more harshly, armed confrontation. Our study argues that indirect rivals can influence the risk of civil war for a focal state. In particular, we distinguish two types of indirect rivalry: 'allies of rivals' and 'rivals of allies' (see Figure 2).

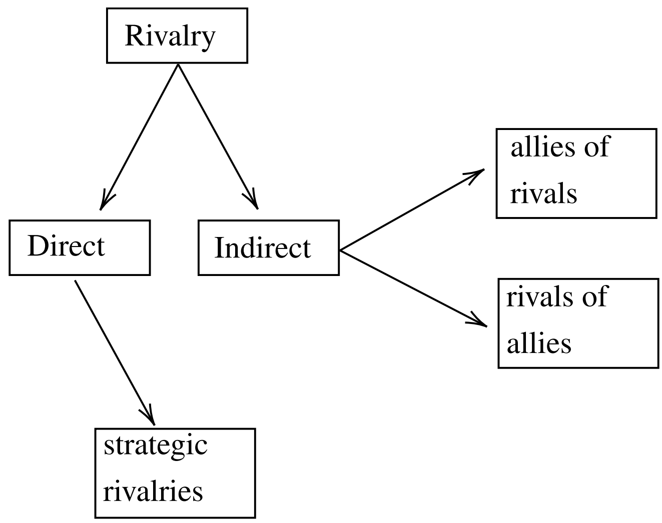


**Figure 2.** Characterization of the forms of rivalry.

For that, we see international relations as 'a set of interconnected networks' and we employ *Social Network Analysis* (SNA) methodology to measure direct and indirect relations of friendship and rivalry. We will first construct a social network of rivalry. A 'social network consists of a fine set or sets of actors [in court case, states] and the relation or relations [in court case, 'is the rival of'] defined of them' (Wasserman and Faust 1994, 20). The rule 'is the rival of' stipulates that state *i* is a strategic rival of *j*, in the sense of Goertz, Diehl, and Balas (2016) and *j* is a strategic rival of *i*. In other words, we construct a symmetric relational network (also called a one-mode network) with the binary rule: 'is the rival of' for defines direct rivalry ties in the international system. In this study, we will represent our networks by matrices.

Moreover, states that share common enemies have a similar perception of international politics. Therefore, from the network of direct rivalries, we deduce a network of direct alliances, where states with common enemies have an interest in forming an alliance. Indeed, in the context of an anarchic international system, actors may be encouraged to form alliances at the international level, as no state is able to ensure its security on the basis of individual power alone (Gowa 1999). In the next section, we will deduce indirect rivalry relations from these two networks.

sOn the one hand, for a given country, the rival of an ally can be considered a rival. The latter may seek to destabilise the focal state to counterbalance the hostile alliance it faces or if it feels it is a potential target of that alliance. On the other hand, a rival's ally can also be considered a rival of a given country. Indeed, this ally of the rival has every interest in weakening the focal state to preserve its alliance. Thus, indirect rivals may contribute to the financing of insurgencies or the implementation of economic and diplomatic sanctions alongside direct rivals. Our hypothesis regarding the effect of direct and indirect rivalries on the risk of civil war is as follows:

Hypothesis 1: The more direct and indirect rivals a country has, the more likely it is to experience civil war.

The existing studies on the effect of direct rivalries on the risk of civil war do not consider the balance of power between rivals. In particular, a country with a sufficiently high military capacity vis-à-vis an armed group is better able to contain the perverse effect of rivalries than a militarily weak country.

Silve and Verdier's (2018) theoretical model shows that, for a country with high levels of military capacity (police, intelligence), deterrence (or even repression) appears to be more effective than redistribution. In general, when the level of state capacity in a country is high, the opportunity cost of conflict becomes higher for the armed group. Thus, under these conditions, the objective of rivals might be to reduce the opportunity cost of rebellion by providing the necessary military assistance to the armed group. One might therefore expect that the lower the military capacity of the focal country relative to its rivals (direct and indirect), the higher the risk of civil war for the latter.

Hypothesis 2: The lower a country's military capacity relative to its direct and indirect rivals, the greater the risk of civil war for that country.

## Measuring Rivalries

As discussed earlier, the principle of rivalry can be considered in two stages according to Figure 2: direct rivalries and indirect rivalries that can lead to a possible anticipation of hostile actions. In this subsection, we detail the construction of our direct and indirect rivalry matrices.

### *Measurement of Direct Rivalries*

We consider two states as direct rivals if they are strategic rivals. Data on strategic rivalries are taken from Goertz, Diehl, and Balas (2016) and are available until 2015. Goertz, Diehl, and Balas (2016) consider a broad set of interactions between states to define rivalries, including diplomatic relations, intergovernmental ties, interstate wars and their possible resolutions.[2]

We consider as rivals the country dyads with a score strictly lower than 0.5, that is those responding to the criteria 'severe rivalry' and 'lesser rivalry' (see Goertz, Diehl, and Balas 2016). In the 'severe rivalry' category, states actually see each other as rivals and competitors (Colaresi, Rasler, and Thompson 2008). This is the highest level of rivalry. The existing rivalries between India and Pakistan since 1947 illustrate this first category. On the other hand, the category 'lesser rivalry' contains rivalries of lesser intensity, such as Colombia and Venezuela in the years 1900-1982.

Thus, we obtain a matrix of direct rivalries, $RD_t$ ($n \times n$), where the rows and columns represent the $n$ states recognised in the international system during the year $t$. The entries in this matrix $rd_{ij}$ are 1 when state $i$ and $j$ are direct rivals in year $t$, and 0 otherwise. Note that the matrix $RD_t$ is symmetrical ($rd_{ij} = rd_{ji}$ i, j $\in$ $RD_t$) and the cells on the diagonal take the value 0 (an actor cannot be in competition with itself).

### *Measurement of Indirect Rivalries*

To measure indirect rivalries, we proceed in two steps:

(1) We construct the first order alliance matrix defined by $AD_t$;
(2) We construct the second order (indirect) rivalry matrix defined by $RI_t$. The entries of this matrix $ri_{ij}$ are 1 if $j$ is the rival of an ally of $i$ ($RA_t$) and/or if $j$ is the ally of a rival of $i$ ($AR_t$); and 0 otherwise.

**Alliance of the 1$^{st}$ order**: As discussed in the literature review, states facing common threats have an interest in forming an alliance (Gowa 1999). To identify these states, we use the previous direct rivalry matrix ($RD_t$) such that $AD_t = RD_t \times RD_t$.[3] In this case, each entry in the $ad_{ij}$ matrix indicates the number of common rivals between $i$ and $j$ and the diagonal indicates the total number of rivals for state $i$ (matrix $AD_t^1$ – Table 1b). Since we are interested in whether there is at least one common rival between $i$ and $j$, we normalise the diagonal to 0 and we assign the value 1 to the entries of the matrix $ad_{ij}^1 \geq 1$ (matrix $AD_t^2$ – Table 1c). In addition, we ensure that the links in the matrix are balanced (matrix $AD_t^3$ – Table 1d). Indeed, in our alliance matrix, the rival of my rival can also be my rival. This is known as imbalanced relationship. We correct for this bias in the $AD_t^3$ matrix by doing the following

**Table 1.** Hypothetical case of first-order rivalries and alliances between five states.

(a) $RD_t$

| $RD_t$ | A | B | C | D | E |
|---|---|---|---|---|---|
| A | 0 | 0 | 0 | 0 | 1 |
| B | 0 | 0 | 0 | 0 | 1 |
| C | 0 | 0 | 0 | 1 | 0 |
| D | 0 | 0 | 1 | 0 | 1 |
| E | 1 | 1 | 0 | 1 | 0 |

(b) $AD_t^1 = RD_t \times RD_t$

| $AD_t^1$ | A | B | C | D | E |
|---|---|---|---|---|---|
| A | 1 | 1 | 0 | 1 | 0 |
| B | 1 | 1 | 0 | 1 | 0 |
| C | 0 | 0 | 1 | 0 | 1 |
| D | 1 | 1 | 0 | 2 | 0 |
| E | 0 | 0 | 1 | 0 | 3 |

(c) diag $(AD_t^1) = 0$ et $ad_{ij}^1 = 1$ if $ad_{ij}^1 \geq 1$

| $AD_t^2$ | A | B | C | D | E |
|---|---|---|---|---|---|
| A | 0 | 1 | 0 | 1 | 0 |
| B | 1 | 0 | 0 | 1 | 0 |
| C | 0 | 0 | 0 | 0 | 1 |
| D | 1 | 1 | 0 | 0 | 0 |
| E | 0 | 0 | 1 | 0 | 0 |

(d) $AD_t^3 = AD_t^2 - RD_t$

| $AD_t^3$ | A | B | C | D | E |
|---|---|---|---|---|---|
| A | 0 | 1 | 0 | 1 | -1 |
| B | 1 | 0 | 0 | 1 | -1 |
| C | 0 | 0 | 0 | -1 | 1 |
| D | 1 | 1 | -1 | 0 | -1 |
| E | -1 | -1 | 1 | -1 | 0 |

(e) if $ad_{ij}^3 < 0$ then $ad_{ij}^3 = 0$

| $AD_t^4$ | A | B | C | D | E |
|---|---|---|---|---|---|
| A | 0 | 1 | 0 | 1 | 0 |
| B | 1 | 0 | 0 | 1 | 0 |
| C | 0 | 0 | 0 | 0 | 1 |
| D | 1 | 1 | 0 | 0 | 0 |
| E | 0 | 0 | 1 | 0 | 0 |

Reading Note: Example 1 – A and B are not rivals (matrix a); A and B have one rival in common (matrix b); A and B have at least one rival in common (matrix c); A and B have at least one rival in common and are not rivals (matrix d); A and B are allies (matrix e).

calculation: $AD_t^3 = AD_t^2 - RD_t$. Finally, we normalise the $AD_t^3$ matrix so as to obtain an $AD_t^4$ matrix whose entries $ad_{ij}^4$ are equal to 1 if states *i* and *j* are allied during the year *t*, and 0 otherwise (matrix $AD_t^4$ – Table 1e).

**Rivalry of the 2nd order:**

On the one hand, we define the rivals of the allies by a matrix multiplication of the form $RA_t = AD_t^4 \times RD_t$. The entries of this first $ra_{ij}$ matrix indicate the number of times *j* is a rival of one of the allies of *i* (matrix $RA_t^1$ – Table 2a). Note that this matrix ($n \times n$) is not symmetric because it is the product of two different matrices. Subsequently, we assign the value 1 to the entries of the matrix $ra_{ij}$ when *j* is the rival of at least one ally of *i*, and 0 for the diagonal (matrix $RA_t^2$ – Table 2b). We make sure that the links in our $RA_t$ matrix are well balanced. In particular, *j* can be the rival of an ally of *i* while being in alliance with *i*. Therefore, we consider for country *i* only the *rivals of allies* with whom *i* has no alliances (matrix $RA_t^3$ – Table 2c) using the following calculation: $RA_t^3 = RA_t^2 - AD_t^4$. The final matrix (matrix $RA_t^4$ – Table 2d) is 1 if *j* is the rival of *i*'s ally in year *t* and 0 otherwise.

On the other hand, we define the *allies of the rivals* by a matrix multiplication of the form $AR_t = RD_t \times AD_t$. The entries of this first matrix $ar_{ij}$ indicate the number of times *j* is an ally of one of *i*'s rivals (matrix $AR_t^1$ – Table 2e). As in the previous case, our $AR_t^3$ matrix (Table 2g) allows to control for the cases, where the allies of the rivals of *i* are in alliances with *i*, from the calculation $AR_t^3 = AR_t^2 - AD_t^4$. The final matrix (matrix $AR_t^4$ – Table 2h) is 1 if *j* is the ally of the rival of *i* during the year *t* and 0 otherwise.[4] Thus, the entries of our matrix of indirect rivalries ($RI_t$) are 1 if *j* is the rival of an ally of *i* ($RA_t^4$) and/or if *j* is the ally of a rival of *i* ($AR_t^4$) during the year *t*; and 0 otherwise.[5]

**Table 2.** Hypothetical case of rivalries of the 2nd order between five states.

(a) $RA_t^1 = AD_t^4 \times RD_t$

| $RA_t^1$ | **A** | **B** | **C** | **D** | **E** |
|---|---|---|---|---|---|
| A | 0 | 0 | 1 | 0 | 2 |
| B | 0 | 0 | 1 | 0 | 2 |
| C | 1 | 1 | 0 | 1 | 0 |
| D | 0 | 0 | 0 | 0 | 2 |
| E | 0 | 0 | 0 | 1 | 0 |

(b) if $ra_{ij}^1 \geq 1$ then $ra_{ij}^1$ =1

| $RA_t^2$ | **A** | **B** | **C** | **D** | **E** |
|---|---|---|---|---|---|
| A | 0 | 0 | 1 | 0 | 1 |
| B | 0 | 0 | 1 | 0 | 1 |
| C | 1 | 1 | 0 | 1 | 0 |
| D | 0 | 0 | 0 | 0 | 1 |
| E | 0 | 0 | 0 | 1 | 0 |

(c) $RA_t^3 = RA_t^2$ - $AD_t^4$

| $RA_t^3$ | **A** | **B** | **C** | **D** | **E** |
|---|---|---|---|---|---|
| A | 0 | -1 | 1 | -1 | 1 |
| B | -1 | 0 | 1 | -1 | 1 |
| C | 1 | 1 | 0 | 1 | -1 |
| D | -1 | -1 | 0 | 0 | 1 |
| E | 0 | 0 | -1 | 1 | 0 |

(d) if $ra_{ij}^3 < 0$ then $ra_{ij}^3 = 0$

| $RA_t^4$ | **A** | **B** | **C** | **D** | **E** |
|---|---|---|---|---|---|
| A | 0 | 0 | 1 | 0 | 1 |
| B | 0 | 0 | 1 | 0 | 1 |
| C | 1 | 1 | 0 | 1 | 0 |
| D | 0 | 0 | 0 | 0 | 1 |
| E | 0 | 0 | 0 | 1 | 0 |

(e) $AR_t^1 = RD_t \times AD_t^4$

| $AR_t^1$ | **A** | **B** | **C** | **D** | **E** |
|---|---|---|---|---|---|
| A | 0 | 0 | 1 | 0 | 0 |
| B | 0 | 0 | 1 | 0 | 0 |
| C | 1 | 1 | 0 | 0 | 0 |
| D | 0 | 0 | 1 | 0 | 1 |
| E | 2 | 2 | 0 | 2 | 0 |

(f) if $ar_{ij}^1 \geq 1$ then $ar_{ij}^1$ =1

| $AR_t^2$ | **A** | **B** | **C** | **D** | **E** |
|---|---|---|---|---|---|
| A | 0 | 0 | 1 | 0 | 0 |
| B | 0 | 0 | 1 | 0 | 0 |
| C | 1 | 1 | 0 | 0 | 0 |
| D | 0 | 0 | 1 | 0 | 1 |
| E | 1 | 1 | 0 | 1 | 0 |

(g) $AR_t^3 = AR_t^2$ - $AD_t^4$

| $AR_t^3$ | **A** | **B** | **C** | **D** | **E** |
|---|---|---|---|---|---|
| A | 0 | -1 | 1 | -1 | 0 |
| B | -1 | 0 | 1 | -1 | 0 |
| C | 1 | 1 | 0 | 0 | -1 |
| D | -1 | -1 | 1 | 0 | 1 |
| E | 1 | 1 | -1 | 1 | 0 |

(h) if $ar_{ij}^3 < 0$ then $ar_{ij}^3 = 0$

| $AR_t^4$ | **A** | **B** | **C** | **D** | **E** |
|---|---|---|---|---|---|
| A | 0 | 0 | 1 | 0 | 0 |
| B | 0 | 0 | 1 | 0 | 0 |
| C | 1 | 1 | 0 | 0 | 0 |
| D | 0 | 0 | 1 | 0 | 1 |
| E | 1 | 1 | 0 | 1 | 0 |

Reading note: Example 1: E is the rival of two allies of A (matrix a); E is the rival of at least one ally of A (matrix b); E is the rival of at least one ally of A; and E and A are not allied (matrix c); E is therefore the rival of an ally of A (matrix d). Example 2: C is an ally of a rival of A (matrix e); C is an ally of at least one rival of A (matrix f); C is an ally of at least one rival of A; and C and A are not allied (matrix g); C is therefore an ally of a rival of A (matrix h).

**Table 3.** Example of a rivalry link.

| rivalry matrix | | | | | |
|---|---|---|---|---|---|
| | IRN | USA | RU | CUB | RUS |
| IRN | – | **1** | 0 | 0 | 0 |
| USA | **1** | – | 0 | **1** | **1** |
| RU | 0 | 0 | – | 0 | **1** |
| CUB | 0 | **1** | 0 | – | 0 |
| RUS | 0 | **1** | **1** | 0 | – |

| Alliance Matrix | | | | | |
|---|---|---|---|---|---|
| | IRN | USA | RU | CUB | RUS |
| IRN | – | 0 | 0 | **1** | **1** |
| USA | 0 | – | **1** | 0 | 0 |
| RU | 0 | **1** | – | 0 | 0 |
| CUB | **1** | 0 | 0 | – | **1** |
| RUS | **1** | 0 | 0 | **1** | – |

| indirect rivalry matrix | | | | | |
|---|---|---|---|---|---|
| | IRN | USA | RU | CUB | RUS |
| IRN | – | 0 | **1** | 0 | 0 |
| USA | 0 | – | 0 | 0 | 0 |
| RU | **1** | 0 | – | **1** | 0 |
| CUB | 0 | 0 | **1** | – | 0 |
| RUS | 0 | 0 | 0 | 0 | – |

| total rivalries matrix | | | | | |
|---|---|---|---|---|---|
| | IRN | USA | RU | CUB | RUS |
| IRN | – | **1** | **1** | 0 | 0 |
| USA | **1** | – | 0 | **1** | **1** |
| RU | **1** | 0 | – | **1** | **1** |
| CUB | 0 | **1** | **1** | – | 0 |
| RUS | 0 | **1** | **1** | 0 | – |

To illustrate our point, we propose in the Table 3 an example limited to five countries: Iran, USA, UK, Cuba and Russia. The rivalry and alliance links observed for these countries in 2012 from the calculations made show that Iran faced one direct rival (USA) and one indirect rival (UK) in 2012, making a total of two rivals. Similarly, the UK faced one direct rival in 2012 (Russia) and two indirect rivals (Iran and Cuba).

We then calculate the variable number of rivals defined as the sum of direct and indirect rivals per country/year.[6] Furthermore, we consider the possibility that the spatial distance between rivals can greatly affect the probability of civil war to occur due to the rivalry. To this end, we include a spatial weighting for rivalry ties based on data on minimum distances between countries, as provided by *Cshapes* database (Weidmann, Kuse, and Gleditsch 2010). In this sense, the more distant the rivals are, the lower the weighting factor (*row-standardized spatial weights matrix*). This weighting factor applied to the variable number of rivals is given by the following equation:

$$\begin{cases} \omega_{ij}^{std} = 1\frac{\omega_{ij}}{\sum_{j=1}^{N}\omega_{ij}} \quad if \ \sum_{j=1}^{N}\omega_{ij}\neq 0 \quad and\ j \geq 2 \\ \qquad\qquad\qquad\qquad 1 \quad otherwise \end{cases} \tag{1}$$

where $\omega_{ij}$ is the spatial distance (in km) between country *i* and its rivals j $\in$ [1; . . .; N]. When a state has only one rival or only contiguous rivals, $\omega_{ij}^{std}$ is naturally 1. In addition to the spatial distance between rivals, we decompose our variable number of rivals according to three geographical levels. In particular, we consider global, regional and contiguous rivalries in our econometric analysis.[7] To identify contiguous countries, we use the data from the *Correlates of War (Direct Contiguity Data)*. Similarly, we consider the UCDP/PRIO classification to determine which countries belong to the same region. The aim is to place particular emphasis on forms of regional and contiguous rivalries where foreign interference is more likely to occur (Lee 2018). For example, during the 1980s and 1990s, Iran and Iraq each supported armed groups on both sides in their territorial dispute over the 'Khalij-e Fars' (in farsi) or 'Chatt-el-Arab' (in arabic). Similarly, the support of the Pakistani authorities for the rebels in Kashmir and Jammu engaged in an extremely costly war for India is consistent with this (Roberts 2009).

To illustrate our point, let us consider the case of the Syrian civil war that began on 15 March 2011 (Table 4). In its first phase, the conflict was limited to a set peaceful grievances, but it quickly saw the formation of an armed group determined to overthrow the power in place. Although initially less armed than the Syrian regime, the rebels seized part of the territory until the Syrian government's

**Table 4.** Syria's rivals in 2012.

| | Direct rivalries | Indirect rivalries |
|---|---|---|
| All rivals | USA; Israel; Turkey | Colombia; Guyana; UK; Georgia; Egypt; Yemen; Afghanistan; South Korea; Japan; India; Vietnam; Philippines |
| Regional rivals | Israel; Turkey | Egypt; Yemen |
| Contiguous rivals | Israel; Turkey | |

allies decided to enter the conflict (the Lebanese, Iraqi and Afghan Shiite armed groups, and the Iranian and Russian governments). The rebels' initial success can be partly explained by the military and financial support they received from several foreign states hostile to the Syrian government. Syria faced three strategic rivals in 2012 (Goertz, Diehl, and Balas 2016), namely the United States, Israel and Turkey, who have been actively involved in the Syrian conflict. Moreover, not all other actors involved in supporting the rebels are direct rivals, some of them are indirect. For example, the UK and Yemen are allies of the rival, being respectively an ally of the US and Israel (they have common threats). Indirect rivalry relations also include rivals of allies, such as India and Afghanistan, which are strategic rivals of Syria's Pakistani ally. Specifically, according to our matrix in 2012, Syria had 15 rivals, of which 3 were direct rivals and 12 indirect rivals. If we break down these rivals according to geographical perimeters previously mentioned, 4 were regional rivals and 2 were contiguous. Another example was the US-led war in Iraq in 2003. Many of the countries that took part in this war alongside the US were not in direct rivalry with Iraq (Poland, South Korea, Italy, Georgia, the Netherlands, Denmark, Spain, Portugal).

### *Measuring the Balance of Power between Rivals*

The balance of power between a country $i$ and its rivals $j \in [1; \ldots; N]$ (direct and indirect) is given by the ratio of $i$'s military capability, denoted as $CINC_{it}^{std}$, to that of its rivals as:

$$BP_{it} = \frac{CINC_{it}^{std}}{\sum_{j=1}^{N} CINC_{jt}^{std} \times \omega_{ij}^{std}} \tag{2}$$

Our CINC variable (*Composite Index of National Capability*) comes from *Correlates of War* database and the data is available until 2015.[8] It is an index of military power calculated from various parameters including military expenditure and the size of the army.

When $BP_{it} = 0$, it means that the country has no rivals. On the other hand, if the *BP* score is less than 1 (respectively greater than 1), then country $i$'s military capacity is lower (respectively higher) than that of the rivals. In this situation (when BP < 1), the latter could offer armed groups sufficient military assistance to put country $i$ in difficulty and thus encourage the outbreak of a civil war. Figure 3 below illustrates our point. It shows the number of known civil war outbreaks per country between 1970 and 2015 as a function of the BP score (on average per country).

We observe that countries that never had rivals (e.g. Jamaica, Mexico, Switzerland, Estonia, Finland and the Comoros), and therefore an BP of 0, have never experienced civil wars. In contrast, the highest proportion of civil wars (92/96) is observed in countries with an BP score below 1 (on average between 1970 and 2015). For these countries, the military capacity of rivals is much higher. An example is Nicaragua. With a much lower military capacity than its rivals (BP = 0.49), notably the US, Nicaragua has experienced two outbreaks of civil war. Indeed, as part of its dispute with the Sandinista government, the US did not directly invade Nicaragua but rather delegated conflict activity to the Nicaraguan Contras by funding them (Salehyan, Gleditsch, and Cunningham 2011). Similarly, we can cite the case of Colombia. With an BP equal to 0.47, Colombia has experienced 6 outbreaks of civil war against the FARC, supported by Ecuador and Venezuela (Salehyan, Gleditsch, and Cunningham 2011). Finally, South Africa pursued a policy of external support for armed groups

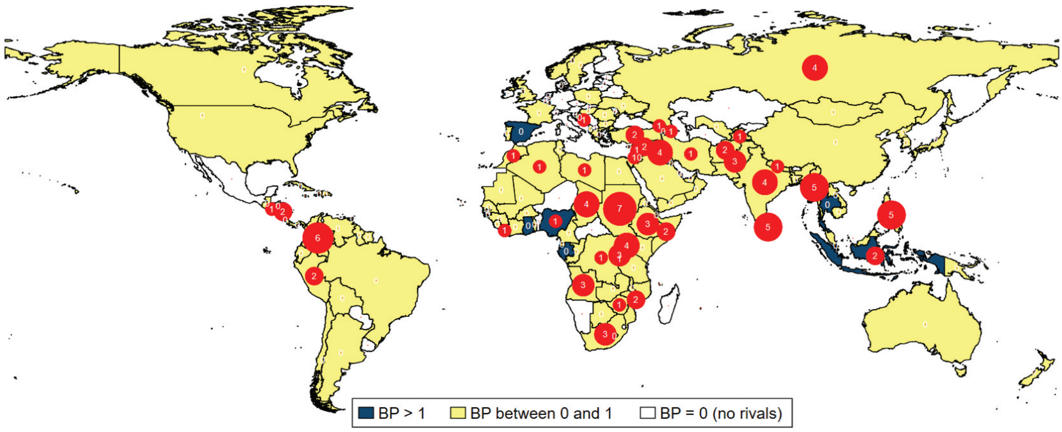


**Figure 3.** Balance of power between the focal state and its rivals between 1970 and 2015.
Note: Between 1970 and 2015, 92 outbreaks of civil war took place in countries with an BP between 0 and 1, i.e. with a military capacity lower than that of their rivals.

in many anti-apartheid countries between 1970 and 1980, including Mozambique (BP = 0.02) and Zimbabwe (BP = 0.03), both of which experienced civil wars (Minter 1994). In the same vein, many countries that are militarily weak relative to their rivals (BP<1) have experienced various civil wars (Afghanistan, Rwanda and Chad).

## Data and Empirical Strategy

We are interested in the effect of the presence of direct and indirect rivals of a given country on its likelihood of experiencing civil war. We mobilise three sets of variables: measures of civil wars; measures of rivalries developed in the previous section; and control variables commonly used in civil war analysis. Our data is available in panel form over the period 1970-2015 and our unit of analysis is the country/year pair.

### *Dependent Variable*

In our empirical analysis, we are interested in the onset of civil war. This variable is coded as a binary variable: a dummy equal to 1 for the first year of civil war, 0 for each year of peace and missing values from the second to the last year of civil war in order to limit reverse causality problems (Bazzi and Blattman 2014; Bosker and Ree 2014). Our dependent variable is taken from the database UCDP/PRIO Armed Conflict with 1000 death/year threshold .[9] It includes civil wars involving a government and an armed group.

### *Control Variables*

There are different control variables commonly used in conflict analysis (Hegre and Sambanis 2006). These are GDP/capita (World Bank), population size (World Bank), measures of ethnic and religious polarisation (Reynal-Querol 2014), a measure of rough terrain (Fearon and Laitin 2003), the level of democratisation using the variable *Xpolity* (Vreeland 2008), a measure of oil rent as a % of GDP (World Bank) and a measure of the number of allies per country that we construct. All these data are annual and are available over our study period, i.e. from 1970 to 2015. The descriptive statistics associated with our variables are presented in Table A2 (Appendix B. Descriptive statistics). At the global level, and in the middle of the Cold War, the United States faced 41 interstate rivals in 1987, of which 25 were indirect rivals. At the regional and contiguous level, China has the highest number of rivalries with respectively 12 rivals until 1972 and 7 rivals until 1987, mainly direct.

### *Empirical Strategy*

We formalise our different specifications using a logit model as in previous work in this field (Bosker and Ree 2014; Toukan 2019).[10] We estimate the following equation:

$$Conflict_{it} = \beta_0 + \beta_1 Nb.riv_{it-1} + \beta_2 Nb.allies_{it-1} + \beta_k X_{it} + \varepsilon_{it} \tag{3}$$

where the binary variable $Conflict_{it}$ is a measure of civil war outbreak in country i on year t; $Nb.riv_{it-1}$ is the number of rivals in country *i* on year *t-1*; $Nb.allies_{it-1}$ is the number of allies of country *i* also on year *t-1*; $X_{it}$ the local (observable) characteristics and $\varepsilon_{it}$ is the error term. Our (robust) standard deviations are clustered at the country level. We lag our independent (time-varying) variables by one year. Finally, we include in each regression a correction for temporal auto-correlation using the method of (Carter and Signorino 2010) which consists of introducing the number of years since the last conflict occurrence as well as the square and cube of this number.[11] Given our theoretical predictions, we expect to have a positive $\beta_1$. The econometric results are presented in the next section.

## Results

Table 5 presents the average marginal effects of each of the variables studied on the probability of experiencing a civil war.[12] As discussed in section 3, we distinguish between different rivalry perimeters, namely global (specifications 1 and 2), regional (specifications 3 and 4) and contiguous (specifications 5 and 6) rivalries.

Our independent variable of interest, number of rivals, which indicates the number of all (direct and indirect) rivals per country/year, is positively correlated with the risk of civil wars across specifications (hypothesis 1). If we consider the regressions without control variables, we can observe

**Table 5.** Number of rivals and civil wars between 1970 and 2015.

| | All rivals | | Regional rivals | | Contiguous rivals | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| nb. $Riv_{t-1}$ | 0.000582** | 0.000526* | 0.00231*** | 0.000650 | 0.00620*** | 0.00437** |
| | (0.000261) | (0.000302) | (0.000561) | (0.000775) | (0.00113) | (0.00173) |
| nb. Allies $_{t-1}$ | −0.000327 | −0.000699 | 0.000526 | 0.00149 | −0.00129 | −0.00559 |
| | (0.000472) | (0.000485) | (0.000755) | (0.00107) | (0.00194) | (0.00373) |
| ln GDPpc $_{t-1}$ | | −0.00346* | | −0.00280 | | −0.00293 |
| | | (0.00189) | | (0.00188) | | (0.00205) |
| ln Pop | | 0.00398*** | | 0.00269** | | 0.00257** |
| | | (0.00122) | | (0.00131) | | (0.00130) |
| xpolity $_{t-1}$ | | 0.000812* | | 0.000872* | | 0.000800 |
| | | (0.000473) | | (0.000485) | | (0.000487) |
| ethnic Pol. | | 0.000205** | | 0.000238*** | | 0.000234*** |
| | | (0.0000844) | | (0.0000875) | | (0.0000876) |
| rel. Pol. | | 0.000170** | | 0.000165** | | 0.000165** |
| | | (0.0000716) | | (0.0000688) | | (0.0000691) |
| ln mountainous | | 0.00377 *** | | 0.00388*** | | 0.00416*** |
| | | (0.00141) | | (0.00138) | | (0.00141) |
| oil $_{t-1}$ | | 0.000395** | | 0.000338** | | 0.000392** |
| | | (0.000165) | | (0.000166) | | (0.000173) |
| *N* | 6219 | 4305 | 6219 | 4305 | 6219 | 4305 |
| control variables | *no* | *yes* | *no* | *yes* | *no* | *yes* |

Note: Robust standard errors in parentheses with ***, ** and * respectively denoting significance at the 1%, 5% and 10% levels. All regressions are performed with corrections for temporal autocorrelation.

at the global level (specification (1)) that the more rivals a country has, the higher its probability of civil war outbreak increases with a rate of 0.05 percentage points per additional rival, *all things being equal*. This rate is higher when we restrict our analysis to regional (specification (3)) and contiguous (specification (5)) rivalries with 0.23 percentage points and 0.62 percentage points respectively. Thus, as the scope of rivalries narrows, the marginal effect of the variable increases. The same observation can be made for regressions with control variables, although the level of significance is naturally lower, especially at the global level (specification (4)).

We can therefore argue that the presence of interstate rivals (direct and indirect) at the global, regional and contiguous level affects the probability of civil wars. This first result from our alternative measure of rivalries is consistent with the literature. Taking only direct rivalries into account, recent studies on the issue confirm this result (Uzonyi 2018; Lee 2018).

As we can see in this table, the results associated with the usual control variables in conflict analysis are in line with the literature (Fauconnet, Malizard, and Pietri 2018; Toukan 2019). The significance of our control variables (GDP/capita; population; ethnic and religious polarisation; rugged terrain and oil rent) is generally stable across the regressions. GDP/capita, which is a good proxy for opportunity costs, is significantly and negatively correlated with the risk of civil wars. Increased income reduces the likelihood of civil wars by discouraging participation in rebel activities. We observe in our Table 5 that the oil rent variable (% GDP) is associated with a higher level of civil war across all specifications. By using locally disaggregated data, recent studies allow us to confirm this result and to better understand the mechanisms that link the presence of natural resources to the risks of civil wars (see Berman et al. 2017 or Sanchez de la Sierra 2020). Population size naturally has a significant and positive effect on the probability of civil war. This result is in line with previous studies. Since the dependent variable is based on an absolute number of victims, the threshold of 1000 deaths is mechanically more likely to be reached when a country is highly populated. The same is true for the measure of rugged terrain (mountain, jungle and forest), which is significant at the 1% threshold. Geographical characteristics are important for the organisation of armed rebellion. The measure of ethnic polarisation has a positive and significant effect (at least at the 5% threshold) on the outbreak of civil war. Ethnic nationalism is generally considered to be a real source of intra-group cohesion and by extension of intergroup civil war. The same result can also be observed for the religious polarisation measure. This result is in line with a recent study by Biong (2020) on the case of Sudan. The level of democracy also favours the risk of civil wars as shown by the positive coefficient (and significant at specification (2) and (4)) associated with this variable. To our knowledge, there is no definitive consensus on the effect of democracy on the risk of civil war and the results are often contradictory in the literature (Berton and Panel 2018). Finally, the coefficient on the number of allies seems to have an overall negative effect on the probability of civil war, although it is not stable. Theoretically, assistance from a third state can have advantages for the regime in place, especially in terms of military capacity (Taydas 2012). However, there is no consensus on the effectiveness of pro-government interventions in the empirical literature (Boutton 2014). The result associated with our alliance matrix therefore converges to the same conclusion as previous work using alternative measures of alliances.

In the rest of our analysis, we propose to decompose the variable number of rivals according to the type of rivals, i.e. direct and indirect rivals, in order to better assess its effect. However, unlike previous estimates, we do not include the contiguous level as this area is mainly composed of direct rivals.[13] Table 6 presents the results obtained. We can thus see that the more a country has direct rivals, the greater its risk of civil war, particularly at the regional level, with a level of significance at least at the 5% threshold. With regard to our independent variable of interest, the number of indirect rivals, we can also observe a positive and significant effect on the probability of civil war (except for estimate (4)). This first result is in agreement with our theoretical predictions and demonstrates the need to integrate a measure of indirect rivalries in the analysis of civil wars.

For all of the above estimates, we have favored the use of random effects in order to retain a maximum number of observations. Indeed, the inclusion of country fixed effects in logit models

**Table 6.** Direct rivalries, indirect rivalries and civil wars between 1970 and 2015.

| | All rivals | | Regional rivals | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| nb. direct riv $_{t-1}$ | 0.00266** | 0.00520** | 0.00428*** | 0.00700** |
| | (0.00116) | (0.00224) | (0.00145) | (0.00289) |
| nb. indirect riv $_{t-1}$ | 0.000676** | 0.000792* | 0.00209** | 0.00165 |
| | (0.000304) | (0.000453) | (0.000963) | (0.00147) |
| nb. allies $_{t-1}$ | −0.00105* | −0.00200** | −0.000315 | −0.00118 |
| | (0.000611) | (0.000981) | (0.000944) | (0.00167) |
| *N* | 6219 | 4305 | 6219 | 4305 |
| control variables | *no* | *yes* | *no* | *yes* |

Note: Robust standard errors in parentheses with ***, ** and * respectively denoting significance at the 1%, 5% and 10% levels. All regressions are performed with corrections for temporal autocorrelation.

excludes countries that have not experienced civil wars (or have always experienced civil wars), which considerably reduces our sample size. In general, while the introduction of country fixed effects is generally advocated for impact analysis, there is no consensus on the use of fixed or random effects in the analysis of the occurrence of civil wars (see Oneal and Russett 2001). However, in Table 7 we propose estimates with country fixed effects in order to identify the internal dynamics of each country (*the within effect*).

We then notice that our previous results persist with or without taking into account the control variables, although the number of observations is considerably reduced. More precisely, the variable number of rivals is significant and positive on all specifications ((1), (2), (5), (6), (9) and (10)). Also, compared to Table 5, it can be observed that the inclusion of country fixed effects increases the marginal effect of the variable. Thus, at the contiguous level, the more rivals a country has, the more its probability of civil war increases at a rate of 4.14 percentage points per additional rival, all else being equal. The last result is obtained after controlling for the control variables.

At the disaggregated level, the results associated with the number of direct and indirect rivals are also satisfactory ((3), (4), (7) and (8)). There are also larger marginal effects than those observed in Table 6. However, a major criticism can be made here based on the question of the endogeneity of the dependent variable on the number of direct rivals. Indeed, the evolution over time of the number of direct rivals may be due to military/diplomatic changes related to the civil war. In contrast, the variable relating to the number of indirect rivals is more exogenous in that it is exclusively linked to the evolution of military/diplomatic relations between rivals and their allies or between allies and rivals. Finally, the coefficient associated with the number of allies is negative and stable throughout the regressions.

As mentioned in previous section, the balance of power (between focal and rival countries) is an important indicator to take into account in the analysis (hypothesis 2). To test this result empirically, we modify our indicator *BP* in order to obtain a measure of the intensity of the threat that a state faces. This indicator is given by:

$$\begin{cases} BP'_{it} = 1 - \frac{CINC^{std}_{it}}{\sum_{j=1}^{N} CINC^{std}_{jt} \times \omega^{std}_{ij}} \; if \; CINC^{std}_{it} < \sum_{j=1}^{N} CINC^{std}_{jt} \\ 0 \; otherwise \end{cases} \tag{4}$$

The variable $CINC^{std}_{it}$ corresponds to the military capacity of state *i* and $CINC^{std}_{jt}$ to the military capacity of the i's rivals with $j \in [1; \ldots; N]$. The use of this indicator ($BP'_{it}$), ranging from 0 to 1, is more appropriate for the interpretation of the estimated coefficient .[14] The higher the score, the lower the military capability of country *i* compared to its rivals. States whose military capacity is equal to or greater than their rivals naturally have a score of 0. Similarly, countries with no rivals have a score of 0. The associated descriptive statistics are presented in Appendix (Table B1). It can thus be seen at the global, regional

**Table 7.** Direct rivalries, indirect rivalries and civil wars between 1970 and 2015 – with Country FE.

| | All rivals | | | | Regional rivals | | | | Contiguous rivals | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| nb. riv $_{t-1}$ | 0.00490 $^{***}$ | 0.00594$^{***}$ | | | 0.0157$^{***}$ | 0.0237$^{***}$ | | | 0.0246$^{**}$ | 0.0414$^{***}$ |
| | (0.00175) | (0.00229) | | | (0.00482) | (0.00689) | | | (0.0110) | (0.0143) |
| nb. direct riv $_{t-1}$ | | | 0.00229 | 0.0342$^{**}$ | | | 0.0116 | 0.0492$^{***}$ | | |
| | | | (0.00708) | (0.0148) | | | (0.00985) | (0.0162) | | |
| nb. indirect riv $_{t-1}$ | | | 0.00508$^{***}$ | 0.00348 | | | 0.0173$^{***}$ | 0.0170$^{**}$ | | |
| | | | (0.00180) | (0.00278) | | | (0.00569) | (0.00692) | | |
| nb. allies $_{t-1}$ | −0.00529$^{*}$ | −0.00643 | −0.00485 | −0.00883 | −0.00552 | −0.0134$^{*}$ | −0.00508 | −0.0169$^{**}$ | −0.0274$^{**}$ | −0.0195 |
| | (0.00294) | (0.00541) | (0.00328) | (0.00569) | (0.00482) | (0.00780) | (0.00488) | (0.00837) | (0.0124) | (0.0235) |
| *N* | 1426 | 898 | 1426 | 898 | 1426 | 898 | 1426 | 898 | 1426 | 898 |
| control variables | *no* | *yes* | *no* | *yes* | *no* | *yes* | *no* | *yes* | *no* | *yes* |

Note: Robust standard errors in parentheses with ***, ** and * respectively denoting significance at the 1%, 5% and 10% levels.
All regressions are performed with corrections for temporal autocorrelation.

and contiguous level that in at least 50% of cases, the strength ratio between a country and its direct and indirect rivals is equal to 0 (either no rivals or focal country stronger than rivals).

To this end, we estimate the following equation:

$$Conflict_{it} = \beta_0 + \beta_1 BP'_{it-1} + \beta_2 CINC^{std}_{kt} + \beta_k X_{it} + \alpha_i + \varepsilon_{it} \tag{5}$$

where the binary variable $Conflict_{it}$ is a measure of the outbreak of civil war; $BP'_{it-1}$ is an indicator of the balance of power between country $i$ and its rivals; $CINC^{std}_{kt}$ is a measure of the military capability of $i$'s allies with $k \in [1; \ldots; N]$; $X_{it}$ s the local characteristics (observables); $\alpha_i$ is a control for country fixed effects and $\varepsilon_{it}$ is an error term. As in the previous analysis, we lag our time-varying independent variables by one year and include a correction for temporal autocorrelation. We present our results in Table 8.

We can see that the balance of power between a given country and its rivals positively and significantly influences the risk of civil war. Thus, controlling for local variables and country fixed effects at the global level (specification (4)), we look at the effect of the balance of power between the focal state and its rivals ($BP'_{it}$) on the outbreak of civil wars. We then find that the coefficient of the variable $BP'$ is significant at the 5% level. Thus, the weaker a country is relative to its global rivals, the higher its probability of civil war. This positive and significant relationship is stable across all equations at the global level, but also across estimates at the regional and contiguous levels. Thus, decreasing levels of military capacity of the focal state relative to rivals favour the recurrence of civil wars for the focal state. In contrast, as can be seen, the military capability of the focal state's allies has no significant effect on its probability of civil war, although the sign of the associated coefficient is negative. This result is in line with our previous results on the utility of allies. The Appendix contains a number of robustness checks, all confirming our baseline results.[15]

In Table 9, we propose estimates at the disaggregated level, distinguishing in particular between direct and indirect rivals. Our results suggest that the balance of power between a state and its indirect rivals has a greater influence on the probability of civil war than that with direct rivals. This result is stable for all our equations at the global level. At the regional level, we observe a significant and positive effect for our variable *$BP'$ direct*, but this result is obtained without country fixed effects.

In general, it should be noted that there is a non-negligible correlation between our variables *$BP'$ direct* and *$BP'$ indirect*, at both global and regional levels (0.74 and 0.55 at global and regional levels respectively). To this end, we propose to remove the direct $BP'$ from our analysis in equations (5) and (10) to correct for this, while controlling for local variables and country fixed effects at the global and regional level. The associated results confirm the importance of our measure of the balance of power between a country and its indirect rivals in the analysis of civil wars.[16]

## Robustness Tests

In this section, we test the robustness of our results by performing two tasks. First, we rank the importance of our independent variables in explaining the outbreak of the civil war, using the random forest algorithm. Second, we test the explanatory power of our dataset, using a Kaplan-Meier estimate to explain the duration of civil wars.

### *Algorithm of Random Forests and Hierarchization of the Determinants of Civil Wars*

To confirm the importance of our independent variables of interest, we propose a hierarchy of civil war determinants based on the random forest algorithm. This algorithm is particularly well suited to predicting rare events, especially for the case of civil wars (Muchlinski, Siroky, and Ekocher 2015). Also, unlike linear regressions, this algorithm allows capturing non-linear interactions between exogenous and endogenous variables (Muchlinski, Siroky, and Ekocher 2015). Figure D1 in the Appendix D provides a comparison of our binary classifiers: the logistic regressions of Table 6 – estimate (2) and Table 9 – estimate (3) and the corresponding random

**Table 8.** Balance of power between the focal state and rivals and civil wars between 1970 and 2015.

| | All rivals | | | | Regional rivals | | | | Contiguous rivals | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| $BP'_{t-1}$ | 0.0215*** | 0.0723** | 0.0159** | 0.0735** | 0.0097** | 0.0547* | 0.0088* | 0.0306 | 0.0133*** | 0.0558 | 0.0084 | 0.0251 |
| | (0.0049) | (0.0319) | (0.0063) | (0.0367) | (0.0039) | (0.0315) | (0.0052) | (0.0441) | (0.0040) | (0.0377) | (0.0052) | (0.0576) |
| $CINC^{Allies}_{t-1}$ | −0.0025 | 0.0084 | −0.0030 | −0.0109 | −0.0029 | −0.0261 | −0.0059 | −0.0341 | 0.0017 | 0.0234 | −0.0250 | −0.0287 |
| | (0.0021) | (0.0155) | (0.0032) | (0.0229) | (0.0063) | (0.0370) | (0.0107) | (0.0455) | (0.0060) | (0.0405) | (0.0229) | (0.0966) |
| *N* | 6219 | 1426 | 4305 | 898 | 6219 | 1426 | 4305 | 898 | 6219 | 1426 | 4305 | 898 |
| Control var. | *no* | *no* | *yes* | *yes* | *no* | *no* | *yes* | *yes* | *no* | *no* | *yes* | *yes* |
| Country FE | *no* | *yes* | *no* | *yes* | *no* | *yes* | *no* | *yes* | *no* | *yes* | *no* | *yes* |

Note: Robust standard errors in parentheses with ***, ** and * respectively denoting significance at the 1%, 5% and 10% levels.
All regressions are performed with corrections for temporal autocorrelation.

**Table 9.** Balance of power between the focal state and rivals (direct and indirect rivalries) and civil wars between 1970 and 2015.

| | All rivals | | | | | Regional rivals | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| $BP'$ direct $_{t-1}$ | 0.00379 | 0.0255 | 0.00422 | 0.0525 | | 0.00898 ** | −0.00699 | 0.0126 ** | 0.00894 | |
| | (0.00593) | (0.0420) | (0.00724) | (0.0529) | | (0.00424) | (0.0351) | (0.00583) | (0.0458) | |
| $BP'$ indirect $_{t-1}$ | 0.0164 *** | 0.0595 ** | 0.0154 *** | 0.0592 * | 0.0724 ** | 0.00266 | 0.0997 *** | 0.000107 | 0.0773 ** | 0.0790 ** |
| | (0.00555) | (0.0280) | (0.00590) | (0.0325) | (0.0304) | (0.00433) | (0.0295) | (0.00500) | (0.0372) | (0.0364) |
| $CINC^{Allies}_{t-1}$ | −0.00296 | 0.00361 | −0.00427 | −0.0184 | −0.00930 | −0.00371 | −0.0351 | −0.00935 | −0.0499 | −0.0465 |
| | (0.00223) | (0.0161) | (0.00356) | (0.0239) | (0.0213) | (0.00699) | (0.0399) | (0.0117) | (0.0464) | (0.0449) |
| *N* | 6219 | 1426 | 4305 | 898 | 898 | 6219 | 1426 | 4305 | 898 | 898 |
| control variables | *no* | *no* | *yes* | *yes* | *yes* | *no* | *no* | *yes* | *yes* | *yes* |
| Country FE | *no* | *yes* | *no* | *yes* | *yes* | *no* | *yes* | *no* | *yes* | *yes* |

Note: Robust standard errors in parentheses with ***, ** and * respectively denoting significance at the 1%, 5% and 10% levels.
All regressions are performed with corrections for temporal autocorrelation.

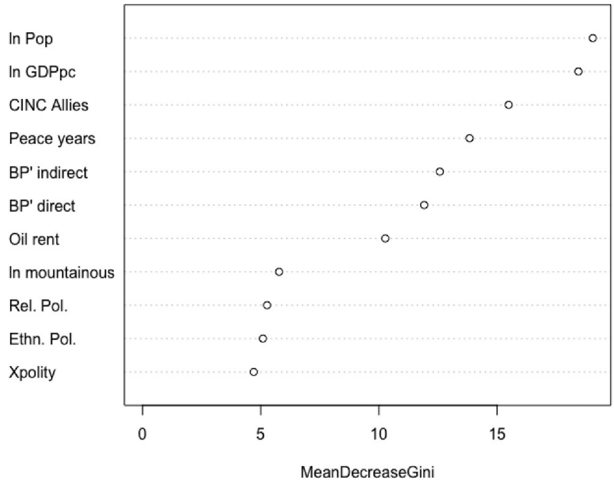


**Figure 4.** Variable importance for random forest.

forest algorithm. From the AUC scores (*Area Under the Curve*), we observe that the predictive performances of the algorithms are approximately equal to those of the logistic regressions.[17]

Figure 4 illustrates the contribution of each independent variable to explaining the outbreak of civil war. The higher the coefficient, the greater the contribution of the independent variable to the model studied. We find that the most important exogenous variables in explaining the outbreak of civil wars are the domestic variables. More specifically, these are the level of national wealth per capita and the size of the population. This result is consistent with the findings of previous work using the random forest algorithm. On the one hand, Muchlinski, Siroky, and Ekocher (2015) consider the standard of living (GDP/capita) as the most important variable to explain the outbreak of civil wars; while for Toukan (2019) it is the size of the population. Moreover, we can also notice that the contribution of our independent variables of interest, $BP'\ direct_{t-1}$ and $BP'\ indirect_{t-1}$ are close to the previous variables. Thus, this result demonstrates that the role of the international context in explaining civil wars is more important than the variables traditionally considered in conflict analysis such as ethnic or religious polarisation indices.

## *Rivalry and Duration of Civil Wars*

The Figure 5 complements our previous result based on the Kaplan-Meier estimate for the duration of civil wars.[18] This is a non-parametric estimate of the probability that the conflict will continue beyond a specific time. Thus, we can see that 25% of civil wars in which the military capacity of the rivals at the global level is greater than that of the focal country last more than 10 years, while this proportion is much lower in the opposite case. At the regional level, the same observation can be made, although the gap is smaller. The civil wars associated with the Cold War provide good examples. During this period, the social fractures introduced by the bipolar confrontation had an important role in the international positioning of many insurgencies. Examples include the civil wars in Angola (1975-2002), Ethiopia (1974-1991), Mozambique (1977-1992), El Salvador (1979-1992), and Burma (since 1948), among others. By receiving foreign support, the rebels gradually adapt to the government's military strategies and manage to develop a certain form of invulnerability. That's why Bapatn (2005) shows that in the long run, rebel groups have less incentive to negotiate with the government.

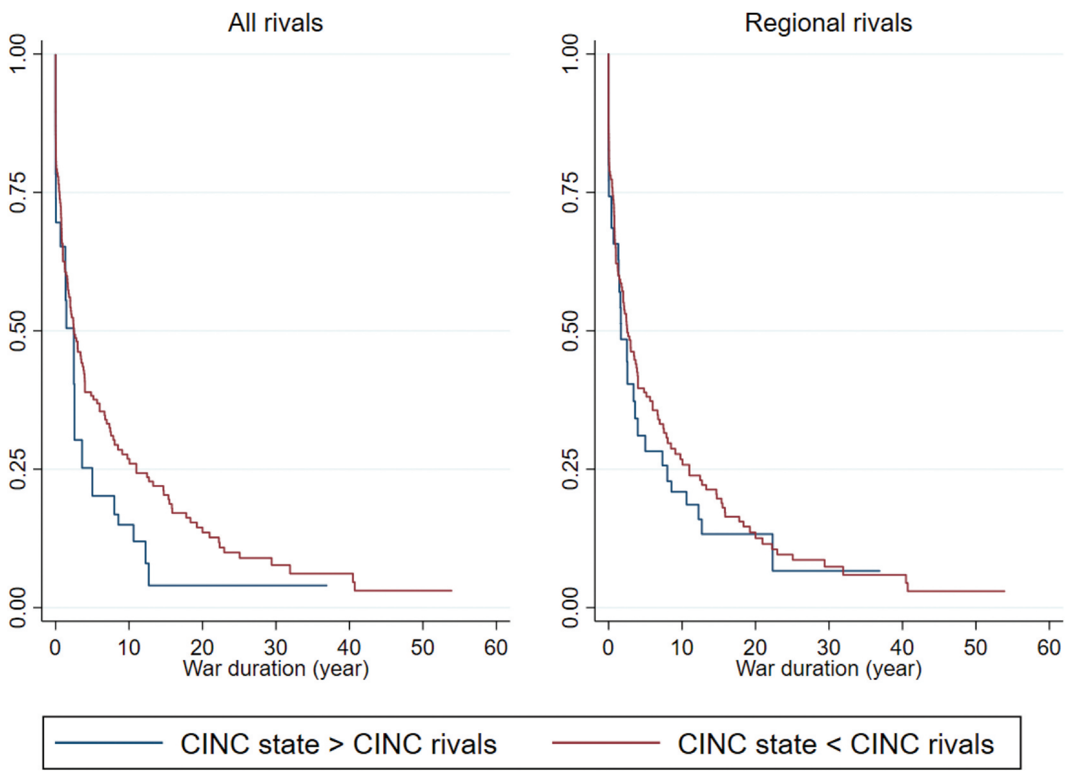


**Figure 5.** Kaplan-Meier survival estimates.

## Conclusions

In this article, we demonstrate that taking indirect rivalries into account in the measurement of interstate rivalries contributes to the understanding of the phenomenon of civil wars. In this perspective, allies develop mutual assistance for offensive purposes. In order to limit the problems linked to information asymmetries and 'commitment problem', The economic literature emphasises the importance of a third party to ensure implementation and compliance (McBride and Skaperdas 2014) between rival parties. Although it is very often supranational bodies that occupy this role of 'third party' to the conflict, some countries can also position themselves as mediators to contain information asymmetries between rival countries.

In particular, this mechanism may be made possible if two rival states, although not having a direct affinity, have a significant structural affinity. Indeed, the existence of a rivalry between two parties inherently indicates the absence of a direct affinity between them, i.e. a military and/or commercial alliance or similar political strategies. In contrast, structural affinity between states reflects an affinity in terms of similarity of ties with other states in the international system (Signorino and Ritter 1999). For example, two states have a similar structural trade affinity if they import and export proportionally to the same countries, despite having no trade relations. By extension, different import and export choices to third countries indicate the absence of a structural trade affinity between states. In this sense, when two rival countries simultaneously have a structural trade affinity with a third country, the third country can act as a mediator between the rivals. One might therefore expect forms of rivalry between countries with structural affinity to be less intense than between rival countries without structural affinity, particularly in terms of the financing of insurgencies. To test this hypothesis, *Social Networks Analysis* tools are suited to the study of interstate relations.

In particular, the metric of structural equivalence resulting from the *SNA* (Lorrain and White 1971) makes it possible to study this type of affinity by identifying, for example, the actors who have similar economic links 'to ' and 'from ' other actors in the network (Wasserman and Faust 1994).

## Notes

1. This strategy consists of sponsoring an armed group in the rival country and providing it with the necessary goods and services (financial, military, logistical, training, advice).
2. More specifically, Goertz, Diehl, and Balas (2016) proposes an index of rivalry between countries defined as follows: 0 – severe rivalry; 0.25 – lesser rivalry; 0.5 – negative peace; 0.75 – warm peace; and 1 – security community.
3. Another way of modelling this form of alliance is from alliance pacts (e.g. military alliances), especially non-aggression pacts (Leeds 2003). Since the behaviour of supposedly rational agents reveals their preferences, the choice to establish alliance pacts assumes that states face common threats.
4. Note in passing that the matrix of allies of rivals is the transpose of the matrix of rivals of allies, such that $AR_t^4 = (RA_t^4)^T$.
5. More generally, Table A1 in the Appendix summarises all the rivalry links obtained from the matrix calculations. For all the triads (country dyads per year) that make up our sample, we obtain 59,272 rivalry links (out of 1,211,712 links). Of these, 1.3% and 81.5% respectively were direct and indirect rivalries only. There are also 17.2% of both direct and indirect rivalry links.
6. When two countries are in both direct and indirect rivalry in a year *t*, we consider them only as direct rivals.
7. For example, Russia and the US are considered global, not regional, rivals. The Republic of Cuba and the USA are regional rivals. Finally, Lebanon and Israel are contiguous rivals.
8. Since the scores are quite disparate across countries, we standardise our observations using the *min-max* (OECD 2008) such as $CINC_{it}^{std} = \frac{CINC_{it} - Min(CINC_{jt})}{Max(CINC_{jt}) - Min(CINC_{jt})}$ with j $\in$ [1; . . .; N]. Thus, we obtain an index between 0 and 1. The higher the index, the greater the country's military capability. When a country's score is 1, it means that it has the highest military capability in the sample (over the period *t*). This approach is favoured by many databases for the construction of indices (e.g. Africa Regional Integration Index, Human Development Index, Doing Business Index, KOF Index of Globalization and Economic Freedom of the World Index).
9. In addition, to test the robustness of our results, we estimate the regressions in Table 7 , 8 and 9 with a categorical dependent variable, defined as follows: 0 if no civil war; 1 if between 25 and 999 deaths/year; 2 if more than 1000 deaths/year. Results available on request.
10. We also used an OLS model for most of the estimates. The main interest of this strategy for our study framework is the conservation of a maximum number of observations when including country fixed effects. However, the significance of our independent variables of interest only varies significantly compared to the use of a logit model. These results are not presented in the paper, but are available upon request
11. We also use the method of Beck, Katz, and Tucker (1998), which consists of introducing the number of years since the last conflict occurrence and the associated cubic splines, calculated from the BTSCS algorithm on STATA. The results remain unchanged.
12. The command *margins, dxdy* in STATA allows us to obtain directly the average effect of the variable studied on the probability of civil war.
13. Thus, about 89% of contiguous rivalries are of the direct type, while only 11% are of the indirect type.
14. The *BP* indicator presented above essentially allowed us to represent in Figure 3 the number of civil wars observed between 1970 and 2015 according to different situations: no rivals (BP =0); focal country weaker than rivals (BP $\in$ ]0;1[) and focal country stronger than rivals (BP $\geq$ 1). However, this indicator is not suitable for our econometric analysis as it complicates the interpretation of our results. The indicator $BP'$ is more appropriate.
15. The BP$'$ indicator is a measure of the intensity of the security challenge faced by a state. When a state has no rivals or is stronger than its rivals, this indicator naturally takes the value of 0. Thus, in order to distinguish between the latter two cases, we propose in the Appendix an alternative measure of strength. This is an ordinal variable equal to 1 if a country has no rivals; 2 if $\sum_{j=1}^{N} CINC_{jt}^{std} \times \omega_{ij}^{std} < CINC_{it}^{std}$ and 3 if $\sum_{j=1}^{N} CINC_{jt}^{std} \times \omega_{ij}^{std} > CINC_{it}^{std}$. For ease of interpretation, however, we include dummies for each category. The results show that, compared to category 1 (no rivals), categories 2 and 3 have a positive and significant effect on the probability of civil wars. The results are presented in Table A7 (Appendix C. Sensitivity Analysis).
16. Although the previous analysis demonstrates the importance of our balance of power measures, a criticism can be made. In particular, within our measure, the same weight is attributed to all rivals regardless of their power. The existing heterogeneity is therefore not taken into account. Table A4 illustrates our point (Appendix C. Sensitivity Analysis). While in the first situation all rivals have the same military capability, this is clearly not the

case in the second situation. In the latter case, rival 1 with a military capacity of 37 is undervalued. The descriptive statistics associated with this new measure are presented in Table A5 (Appendix C Sensitivity Analysis). The results obtained with this new measure are presented in Table A6 (Appendix C Sensitivity Analysis).

17. Generally speaking, the higher the ROC curve (*Receiver Operating Characteristic*) is drawn to the left, the better the quality of the associated classifier.
18. The data on the duration of civil wars comes from Lujala, Rod, and Thieme (2007).

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No potential conflict of interest was reported by the author(s).

## ORCID

Mahdi Fawaz http://orcid.org/0000-0001-9935-2361

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## Appendix A. Cross-tabulation of direct and indirect rivalries observed between country dyads

**Table A1.** Cross-tabulation of direct and indirect rivalries observed between country dyads over the period 1970-2015.

| | $AR_t^4 = 0$ and $RA_t^4 = 0$ | $AR_t^4 = 1$ and $RA_t^4 = 0$; or $AR_t^4 = 0$ and $RA_t^4 = 1$ | $AR_t^4 = 1$ and $RA_t^4 = 1$ | Total |
|---|---|---|---|---|
| $RD_t = 0$ | - | 0 | 48,318 | **48,318 (81,5%)** |
| $RD_t = 1$ | 774 | 4364 | 5816 | **10,954 (18,5%)** |
| **Total** | **774 (1,3%)** | **4364 (7,3%)** | **54,134 (91,4%)** | **59,272 (100%)** |

## Appendix B. Descriptive statistics

**Table A2.** Descriptive statistics.

| Variable | Obs | Mean | Std. Dev. | Min | Max | P25 | P50 | P75 |
|---|---|---|---|---|---|---|---|---|
| Conflict onset | 6373 | .01 | .12 | 0 | 1 | 0 | 0 | 0 |
| ln GDPpc | 6047 | 7.57 | 1.64 | 4.05 | 11.69 | 6.22 | 7.38 | 8.8 |
| ln Pop | 6528 | 9.12 | 1.55 | 4.78 | 14.13 | 8.12 | 9.09 | 10.1 |
| Xpolity | 5905 | 1.57 | 4.87 | −6 | 7 | −3 | 3 | 7 |
| Ethn. Pol. | 5300 | 53.23 | 23.02 | 1.67 | 98.24 | 37.02 | 57.88 | 69.33 |
| Rel. Pol. | 5300 | 48.63 | 35.24 | .12 | 100 | 12.19 | 51.61 | 83.55 |
| ln mountainous (%) | 6249 | 2.05 | 1.42 | 0 | 4.42 | .69 | 2.28 | 3.21 |
| Oil | 6036 | 4.39 | 10.75 | 0 | 88.87 | 0 | .01 | 1.77 |
| *All rivals* | | | | | | | | |
| Nbr. of rivals | 6535 | 6.02 | 9.13 | 0 | 41 | 0 | 1 | 10 |
| Nbr. of allies | 6535 | 2.73 | 4.97 | 0 | 32 | 0 | 0 | 3 |
| Nbr. of direct rivals | 6535 | 1.25 | 1.96 | 0 | 15.73 | 0 | 1 | 2 |
| Nbr. of indirect rivals | 6535 | 4.76 | 7.89 | 0 | 33.03 | 0 | 0 | 8 |
| *Regional rivals* | | | | | | | | |
| Nbr. of rivals | 6535 | 1.85 | 2.36 | 0 | 12 | 0 | 1 | 3 |
| Nbr. of allies | 6535 | 1.08 | 1.7 | 0 | 10 | 0 | 0 | 2 |
| Nbr. of direct rivals | 6535 | .94 | 1.25 | 0 | 10.12 | 0 | .93 | 1 |
| Nbr. of indirect rivals | 6535 | .91 | 1.6 | 0 | 10 | 0 | 0 | 1 |
| *Contiguous rivals* | | | | | | | | |
| Nbr. rivaux | 6535 | .86 | 1.16 | 0 | 7 | 0 | 0 | 1 |
| Nbr. of allies | 6535 | .31 | .7 | 0 | 6 | 0 | 0 | 0 |
| Nbr. of direct rivals | 6535 | .77 | 1.03 | 0 | 6 | 0 | 0 | 1 |
| Nbr. of indirect rivals | 6535 | .09 | .31 | 0 | 3 | 0 | 0 | 0 |

**Table A3.** Descriptive statistics (2).

| Variable | Obs | Mean | Std. Dev. | Min | Max | P25 | P50 | P75 |
|---|---|---|---|---|---|---|---|---|
| *All rivals* | | | | | | | | |
| BP′ | 6535 | .42 | .46 | 0 | 1 | 0 | 0 | .97 |
| BP′ direct | 6535 | .33 | .41 | 0 | 1 | 0 | 0 | .79 |
| BP′ indirect | 6535 | .34 | .45 | 0 | 1 | 0 | 0 | .94 |
| $CINC^{allies}$ | 6535 | .34 | .67 | 0 | 3.37 | 0 | 0 | .17 |
| *Regional rivals* | | | | | | | | |
| BP′ | 6535 | .35 | .42 | 0 | 1 | 0 | 0 | .86 |
| BP′ direct | 6535 | .27 | .38 | 0 | 1 | 0 | 0 | .67 |
| BP′ indirect | 6535 | .2 | .36 | 0 | 1 | 0 | 0 | .2 |
| $CINC^{allies}$ | 6535 | .08 | .21 | 0 | 1.61 | 0 | 0 | .03 |
| *Contiguous rivals* | | | | | | | | |
| BP′ | 6535 | .24 | .36 | 0 | 1 | 0 | 0 | .58 |
| BP′ direct | 6535 | .22 | .35 | 0 | 1 | 0 | 0 | .5 |
| BP′ indirect | 6535 | .03 | .16 | 0 | 1 | 0 | 0 | 0 |
| $CINC^{allies}$ | 6535 | .04 | .19 | 0 | 1.72 | 0 | 0 | 0 |

## Appendix C. Sensitivity Analysis

In order to take into account the existing heterogeneity in the military capability of rivals, we propose to use the indicator (1), where all military capabilities are squared.

**Table A4.** Hypothetical cases of military capabilities.

| | $CINC_{riv1}$ | $CINC_{riv2}$ | $CINC_{riv3}$ | $CINC_{riv4}$ | Total |
|---|---|---|---|---|---|
| first case | 10 | 10 | 10 | 10 | 40 |
| second case | 37 | 1 | 1 | 1 | 40 |

$$\begin{cases} BP_{it}^{hetero} = 1 - \frac{\left(CINC_{it}^{std}\right)^2}{\sum_{j=1}^{N}\left(CINC_{jt}^{std}\right)^2 \times \omega_{ij}^{std}} \text{ if } \left(CINC_{it}^{std}\right)^2 < \sum_{j=1}^{N}\left(CINC_{jt}^{std}\right)^2 \\ 0 \text{ otherwise} \end{cases} \quad (1)$$

All regressions are performed with corrections for temporal autocorrelation.

**Table A5.** Descriptive statistics (3).

| Variable | Obs | Mean | Std. Dev. | Min | Max | P25 | P50 | P75 |
|---|---|---|---|---|---|---|---|---|
| *All rivals* | | | | | | | | |
| $BP^{hetero}$ direct | 6535 | .37 | .45 | 0 | 1 | 0 | 0 | .94 |
| $BP^{hetero}$ indirect | 6535 | .35 | .47 | 0 | 1 | 0 | 0 | .99 |
| *Regional rivals* | | | | | | | | |
| $BP^{hetero}$ direct | 6535 | .31 | .43 | 0 | 1 | 0 | 0 | .85 |
| $BP^{hetero}$ indirect | 6535 | .22 | .4 | 0 | 1 | 0 | 0 | .09 |
| *Contiguous rivals* | | | | | | | | |
| $BP^{hetero}$ direct | 6535 | .26 | .4 | 0 | 1 | 0 | 0 | .66 |
| $BP^{hetero}$ indirect | 6535 | .04 | .18 | 0 | 1 | 0 | 0 | 0 |

We note that our previous results persist. The measure of the ratio of power between a country and its indirect rivals does have a positive and significant effect on the occurrence of civil wars. This result is globally stable across all specifications.

**Table A6.** Heterogeneous power relations between focal and rival states (direct and indirect rivals) and civil wars between 1970 and 2015.

| | All rivals | | | | | Regional rivals | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| $BP^{hetero}$ direct$_{t-1}$ | 0.00522 | 0.0343 | 0.00236 | 0.0328 | | 0.00707* | −0.0199 | 0.00987* | −0.0196 | |
| | (0.00548) | (0.0341) | (0.00655) | (0.0486) | | (0.00374) | (0.0318) | (0.00506) | (0.0430) | |
| $BP^{hetero}$ indirect $_{t-1}$ | 0.0138** | 0.0529** | 0.0149*** | 0.0663** | 0.0725 ** | 0.00405 | 0.0894*** | 0.000855 | 0.0703** | 0.0662** |
| | (0.00550) | (0.0242) | (0.00553) | (0.0300) | (0.0284) | (0.00375) | (0.0276) | (0.00448) | (0.0345) | (0.0324) |
| $CINC^{Allies}_{t-1}$ | −0.00225 | 0.00714 | −0.00271 | −0.00826 | −0.00105 | −0.00400 | −0.0184 | −0.00895 | −0.0268 | −0.0356 |
| | (0.00215) | (0.0157) | (0.00355) | (0.0235) | (0.0204) | (0.00669) | (0.0397) | (0.0116) | (0.0479) | (0.0455) |
| *N* | 6219 | 1426 | 4305 | 898 | 898 | 6219 | 1426 | 4305 | 898 | 898 |
| control variables | *no* | *no* | *yes* | *yes* | *yes* | *no* | *no* | *yes* | *yes* | *yes* |
| Country FE | *no* | *yes* | *no* | *yes* | *yes* | *no* | *yes* | *no* | *yes* | *yes* |

Note: Robust standard errors in parentheses with ***, ** and * respectively denoting significance at the 1%, 5% and 10% levels.

**Table A7.** Balance of power between the focal state and rivals (ordinal variable) and civil wars between 1970 and 2015.

| | All rivals | | | | Regional rivals | | | | Contiguous rivals | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| Cat2 $_{t-1}$ | 0.0273*** | 0.119*** | 0.0192** | 0.141*** | 0.0327*** | 0.136*** | 0.0225** | 0.168*** | 0.0227*** | 0.121*** | 0.0116* | 0.148** |
| | (0.0082) | (0.0405) | (0.009) | (0.0499) | (0.0068) | (0.0377) | (0.0087) | (0.053) | (0.0055) | (0.0424) | (0.0062) | (0.060) |
| Cat3 $_{t-1}$ | 0.0297*** | 0.087*** | 0.0176** | 0.0973** | 0.0259*** | 0.0878*** | 0.0167** | 0.0855* | 0.0219*** | 0.0927** | 0.0093 | 0.0953 |
| | (0.006) | (0.033) | (0.007) | (0.044) | (0.006) | (0.033) | (0.007) | (0.048) | (0.005) | (0.041) | (0.005) | (0.063) |
| $CINC_{t-1}^{Allies}$ | −0.0014 | 0.0195 | −0.0009 | 0.0112 | −0.003 | −0.0114 | −0.0033 | −0.034 | −0.0008 | 0.0194 | −0.0280 | −0.0372 |
| | (0.0019) | (0.0161) | (0.0032) | (0.0263) | (0.0062) | (0.0376) | (0.0106) | (0.0455) | (0.0056) | (0.0409) | (0.0262) | (0.116) |
| *N* | 6219 | 1426 | 4099 | 812 | 6219 | 1426 | 4099 | 812 | 6219 | 1426 | 4099 | 812 |
| Contr. var. | *no* | *no* | *yes* | *yes* | *no* | *no* | *yes* | *yes* | *no* | *no* | *yes* | *yes* |
| Country FE | *no* | *yes* | *no* | *yes* | *no* | *yes* | *no* | *yes* | *no* | *yes* | *no* | *yes* |

Note: Robust standard errors in parentheses with ***, ** and * respectively denoting significance at the 1%, 5% and 10% levels. All regressions are performed with corrections for temporal autocorrelation.

## Appendix D. Comparing ROC Curves

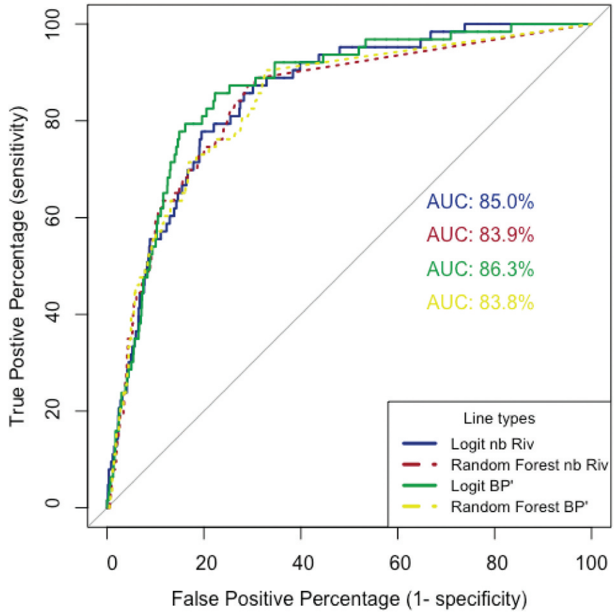


**Figure A1.** Comparing ROC curves.